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Prevalence of wheezing in the chest among adults from the 1982 Pelotas birth cohort, Southern Brazil

ABSTRACT

OBJECTIVE: To estimate the prevalence of wheezing in the chest among adults, and to explore the effect of some variables on the prevalence of this condition.

METHODS: This was a prospective cohort study on individuals born in the city of Pelotas (Southern Brazil) in 1982. A total of 4,297 subjects was traced in 2004-5, representing 77.4% of the original cohort. Data were collected by means of interviews using the ISAAC (International Study of Asthma and Allergies in Childhood Steering Committee) questionnaire. Associations between the outcome "occurrence of wheezing in the chest within the 12 months prior to the interview" and the variables of socioeconomic, demographic and birth characteristics were tested by means of multivariable analyses, using Poisson regression.

RESULTS: The prevalence of wheezing over the preceding year was 24.9%. Among the individuals reporting wheezing, 54.6% reported difficulty in sleeping, and 12.9% reported difficulty in speaking due to wheezing. The prevalence of wheezing in the chest was significantly higher among women. This association was maintained in analyses adjusted for non-white skin color, family history of asthma and low socioeconomic level. Among men, there was no significant association in the analyses adjusted for skin color and family income at birth. Family histories of asthma and poverty throughout life presented significant associations with wheezing in the chest. For both sexes, there were no associations with the variables of birth weight and breastfeeding duration.

CONCLUSIONS: The prevalence of wheezing in the chest was high, and subjects with low family income at birth were more likely to have had wheezing in the chest over the preceding year.

DESCRIPTORS: Adult. Asthma, epidemiology. Respiratory Sounds. Socioeconomic Factors. Risk Factors. Cohort Studies. Brazil.

INTRODUCTION

The prevalence, incidence and severity of asthma are increasing worldwide. Although the number of studies on asthma in childhood is increasing,¹⁸ most of the data on the prevalence of asthma among young adults comes from developed countries.⁵ Studies in middle or low-income countries are needed for better understanding of the epidemiology of this disease among adults.

The various diagnostic methods used in clinical practice are still little used for epidemiological surveys, particularly for household-based surveys. In

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most such studies, the diagnosis is based on reported symptoms, especially wheezing in the chest.¹⁸ Population-based studies may also help in understanding the role of socioeconomic factors and early influences on the epidemiology of asthma.

The aims of the present study were to estimate the prevalence of wheezing in the chest among young adults and to explore the effect of some independent variables on occurrences of this morbidity.

METHODS

All the births that occurred in hospitals in the city of Pelotas in 1982 were identified. The mothers were interviewed and the newborns were weighed. This population was followed up on different occasions. In 2004-5, all the members of the cohort were sought, and a monitoring rate of 77.4% (N = 4,297) was achieved. Details of the methodology of the cohort have already been published.^{4,15,16}

To define the outcome of the present study, the questionnaire of the International Study of Asthma and Allergies in Childhood Steering Committee (ISAAC) was used.^{3,18} This has already been validated in Brazil.¹ Firstly, the subjects were asked whether they had ever had wheezing in the chest during their lives. Then, those who answered affirmatively were asked how many crises of wheezing in the chest they had had over the past year and whether they had any family history of paternal or maternal asthma.

The independent variables gathered were: sex; self-reported skin color (White or Black/Mixed); family income reported by the mother in 1982, in minimum monthly wages (MMW); family income in 2004-5 (in MMW); birth weight, in grams; and duration of breastfeeding, in months. Based on the income at birth and present income, the change in income between 1982 and 2004-5 was defined and categorized into four groups: always poor; non-poor to poor; poor to non-poor; and never poor. The individuals within the lowest tercile of income were defined as poor.

Bivariate analyses were based on the chi-square test for heterogeneity or linear trend. Poisson's regression was used for multivariable analysis stratified by sex and in accordance with a conceptual model in which the variables of skin color, family history of asthma, maternal schooling level and family income at birth were grouped into the first level. The variables of birth weight and duration of breastfeeding were analyzed separately, in the second and third levels, respectively. For the adjusted analysis, all the variables with $p < 0.20$ were kept in the model.

Verbal informed consent was obtained from the adults responsible for the children during the phase of the study from 1982 to 1986, as was the common practice

at that time, when there was no ethics committee at the Federal University of Pelotas. For the more recent phases, the university's ethics committee, which is affiliated to the National Council for Research Ethics (*Conselho Nacional de Ética em Pesquisa*, CONEP), approved the study and written informed consent was obtained from the participants.

RESULTS

Among the young adults who answered the questionnaire on asthma, 2,231 (52.0%) reported that they had had wheezing in the chest at some time during their lives. A total of 1,067 members of the cohort (24.9%) reported wheezing in the chest over the past year. The mean number of crises of wheezing reported by these individuals over the 12 months preceding the interview was 5.7, with a median of two crises. Among those who reported wheezing in the chest over the past year, 54.6% said they had difficulty in sleeping and 12.9% had difficulty in speaking, consequent to the crises. The prevalence of dry coughing at night without colds, over the 12 months preceding the interview, was 38.7%, while 14.4% of the interviewees reported wheezing in the chest after doing physical exercise. Family histories of asthma (father or mother) were reported by 8.8% of the interviewees.

Table 1 presents the prevalence of wheezing in the chest over the 12 months preceding the interview, according to the independent variables and stratified by sex. For both sexes, the prevalence was greater among individuals with a family history of asthma. Among the women, mixed or Black skin color and low socioeconomic level were associated with greater prevalence of wheezing. Among the men, those who had never been poor presented lower frequency of this outcome. For both sexes, birth weight and duration of breastfeeding did not present associations with occurrences of wheezing in the chest.

Table 2 shows the prevalence ratios in the crude and adjusted analyses for the men. Individuals with a family history of asthma presented a risk of wheezing in the chest that was around twice the risk among those without a family history of this condition. Individuals who had never been poor presented lower risk. Even after adjusting for possible confounding factors, skin color, birth weight and duration of breastfeeding were not associated with a risk of wheezing in the chest.

Table 3 presents the results for the women. Skin color and family history of asthma continued to be associated with wheezing after adjustments. Low family income at birth and poverty throughout life were associated with this outcome, and also in the adjusted analysis. The absence of effects from the variables of birth weight and duration of breastfeeding on the prevalence of wheezing in the chest among the women persisted in the adjusted analysis.

Table 1. Prevalence of wheezing in the chest, according to sex. Pelotas, Southern Brazil, 1982 to 2004-5.

Variable	N	%	Men		Women	
			n	%	n	%
Skin color*,**		0.005***	0.62***		0.001***	
White	3232	23.5	1657	22.7	1575	24.3
Black or mixed	907	28.0	471	23.8	436	32.6
Family history of asthma (father and/or mother)**		<0.001***	<0.001***		<0.001***	
No	3867	23.1	2009	21.6	1858	24.8
Yes	372	41.4	172	43.0	200	40.0
Family income in 1982 (MW)**		<0.001****	0.12****		<0.001***	
≤ 1	850	27.5	437	24.3	413	31.0
1.1 - 3	2123	26.2	1094	23.9	1029	28.7
3.1 - 6	799	22.7	417	23.7	382	21.5
6.1 - 10	251	18.3	130	20.0	121	16.5
> 10	243	18.1	123	17.9	120	18.3
Change in income (1982 → 2004-5)**		<0.001****	0.01****		<0.001****	
Always poor	705	31.6	334	25.1	371	37.5
Not poor → poor	714	29.1	340	28.8	374	29.4
Poor → not poor	664	26.4	359	25.3	305	27.5
Never poor	2205	20.9	1178	20.7	1027	21.1
Birth weight (grams)**		0.17****	0.16****		0.80****	
< 2500	300	27.3	136	28.7	164	26.2
2500 to 2999	1019	27.0	451	26.2	568	27.6
3000 to 3499	1630	23.3	847	21.5	783	25.3
3500 to 3999	1098	24.1	612	22.2	486	26.5
≥ 4000	240	27.1	165	25.5	75	30.7
Breastfeeding (months)**		0.10***	0.16***		0.44***	
< 1.0	899	25.0	483	22.8	416	27.6
1.0 - 2.9	1070	23.3	543	22.5	527	24.1
3.0 - 5.9	953	24.7	485	24.1	468	25.2
6.0 - 8.9	393	27.7	203	26.6	190	28.9
9.0 - 11.9	159	19.5	83	13.3	76	26.3
≥ 12.0	680	28.1	335	26.3	345	29.9
Total*****	4288	24.9	2211	23.4	2077	26.5

MW: Minimum wage

* 149 interviewees self-classified as East Asian or indigenous

** Out of 4297 interviewees in 2004-5, there was a lack of information for up to 143 individuals (3.3% of the interviewees).

*** Chi-square test for heterogeneity

**** Chi-square test for linear trend

***** For nine interviewees in 2004-5, there was no information on wheezing in the chest over the 12 months preceding the interview

DISCUSSION

Around a quarter of the young adults in the 1982 Pelotas cohort reported wheezing in the chest over the past year. In the National Health and Nutrition Examination Survey (NHANES III), conducted in the United States, the prevalence of wheezing in the chest over the 12 months preceding the interview, among adults aged 20 years and over was 16.4%, while the prevalence of a medical

diagnosis of asthma was 4.5%.² In the Behavioral Risk Factor Surveillance System of 2000 (BRFSS-2000), 7.2% of the adults living in the United States reported that a doctor had told them that they had asthma and that the symptoms continued until the time of the interview.⁸ In Australia, the prevalence of wheezing in the chest over the last year ranged from 17% to 29% among adults (20 to 44 years of age).¹⁷ In a European study covering several countries, the prevalence of

Table 2. Crude and adjusted analyses on the effects of the independent variables on the prevalence of wheezing in the chest over the 12 months preceding the interview, for males. Pelotas, Southern Brazil, 1982 to 2004-5.

Variable	Crude analysis			Adjusted analysis*		
	PR	95% CI	p	PR	95% CI	p
Skin color			0.62**			0.69**
White	1	-		1	-	
Black or Mixed	1.05	0.87;1.26		1.04	0.86;1.26	
Family history of asthma (father and/or mother)			<0.001**			<0.001**
No	1	-		1	-	
Yes	2.00	1.65;2.42		2.00	1.66;2.43	
Family income in 1982 (MW)			0.12***			0.17***
≤1.0	1.36	0.90;2.05		1.30	0.86;1.97	
1.1-3.0	1.34	0.90;1.98		1.32	0.89;1.94	
3.1-6.0	1.33	0.88;2.01		1.32	0.88;1.99	
6.1-10.0	1.12	0.67;1.87		1.06	0.64;1.77	
>10.0	1	-		1	-	
Change in income (1982 → 2004-5)			0.01***			0.01***
Always poor	1.21	0.98;1.51		1.20	0.96;1.51	
Not poor → poor	1.39	1.14;1.70		1.38	1.12;1.69	
Poor → not poor	1.22	0.99;1.51		1.19	0.96;1.48	
Never poor	1	-		1	-	
Birth weight (grams)**			0.15***			0.15***
< 2500	1.13	0.78;1.63		1.11	0.77;1.61	
2500-2999	1.03	0.76;1.39		1.02	0.75;1.40	
3000-3499	0.84	0.63;1.13		0.83	0.62;1.12	
3500-3999	0.87	0.65;1.18		0.88	0.65;1.20	
> 4000	1	-		1	-	
Breastfeeding (months)			0.20***			0.32***
< 1.0	0.87	0.68;1.11		0.85	0.66;1.08	
1.0-2.9	0.86	0.67;1.09		0.85	0.67;1.08	
3.0-5.9	0.92	0.72;1.17		0.91	0.71;1.16	
6.0-8.9	1.01	0.76;1.35		1.01	0.75;1.36	
9.0-11.9	0.50	0.28;0.90		0.57	0.32;1.02	
> 12.0	1	-		1	-	

MW: Minimum wage

* Adjusted for skin color, family history of asthma, maternal schooling level and family income at birth, at the first level, birth weight at the second level and duration of breastfeeding at the third level.

** Wald test for heterogeneity

*** Wald test for linear trend

asthma among young adults (20 to 44 years of age) was 4.5%, although there was great variability between the countries.⁹ The study by Pearce et al¹³ showed that there was high concordance between the instruments used in ISAAC and the European Committee of Respiratory Health Survey,¹³ which allows comparison between our findings and those from the European study.

In the present study, the women presented a risk of reporting wheezing in the chest that was 12% greater than the risk among the men. This corroborates the

data from BRFSS-2000, NHANES III for wheezing in the chest² and another Brazilian study on asthma symptoms.¹¹ However, it needs to be borne in mind that, in childhood, the prevalence of wheezing in the chest is greater among boys than among girls.⁶ In our study, the Black or Mixed women presented a greater risk of wheezing in the chest, thus confirming the data of BRFSS-2000, in which Blacks presented greater occurrence of asthma than did Whites.⁸ On the other hand, in NHANES III, the prevalence of wheezing in

Table 3. Crude and adjusted analyses on the effects of the independent variables on the prevalence of wheezing in the chest over the 12 months preceding the interview, for females. Pelotas, Southern Brazil, 1982 to 2004-5.

Variable	Crude analysis			Adjusted analysis*		
	PR	95% CI	p	PR	95% CI	p
Skin color			<0.001**			0.01**
White	1	-		1	-	
Black or Mixed	1.34	1.14;1.57		1.26	1.07;1.48	
Family history of asthma (father and/or mother)			<0.001**			<0.001**
No	1	-		1	-	
Yes	1.61	1.34;1.94		1.60	1.33;1.92	
Family income in 1982 (MW)			<0.001***			0.001***
≤1.0	1.69	1.13;2.53		1.52	1.01;2.27	
1.1-3.0	1.56	1.06;2.31		1.45	0.99;2.13	
3.1-6.0	1.17	0.77;1.79		1.12	0.74;1.71	
6.1-10.0	0.90	0.52;1.56		0.89	0.52;1.54	
>10.0	1	-		1	-	
Change in income (1982 → 2004-5)			<0.001***			<0.001***
Always poor	1.77	1.49;2.12		1.58	1.31;1.92	
Not poor → poor	1.39	1.14;1.69		1.33	1.09;1.62	
Poor → not poor	1.30	1.05;1.62		1.26	1.00;1.58	
Never poor	1	-		1	-	
Birth weight (grams)			0.97***			0.30***
< 2500	0.85	0.56;1.31		0.75	0.49;1.15	
2500-2999	0.90	0.63;1.30		0.83	0.58;1.19	
3000-3499	0.82	0.57;1.18		0.80	0.56;1.13	
3500-3999	0.87	0.60;1.25		0.86	0.59;1.24	
> 4000	1	-		1	-	
Breastfeeding (months)			0.21***			0.18***
< 1.0	0.93	0.74;1.16		0.93	0.74;1.17	
1.0-2.9	0.81	0.65;1.01		0.82	0.66;1.03	
3.0-5.9	0.84	0.67;1.06		0.90	0.72;1.13	
6.0-8.9	0.97	0.74;1.28		1.07	0.81;1.40	
9.0-11.9	0.88	0.59;1.33		0.92	0.61;1.40	
> 12.0	1	-		1	-	

MW: Minimum wage

* Adjusted for skin color, family history of asthma, maternal schooling level and family income at birth, at the first level, birth weight at the second level and duration of breastfeeding at the third level.

** Wald test for heterogeneity

*** Wald test for linear trend

the chest over the past year was slightly higher among Whites than among Blacks.² Thus, there is no agreement between the studies regarding this association.

Our results showed that individuals with lower income presented a higher risk of wheezing in the chest, which was also in agreement with data from BRFSS-2000.⁸ A study conducted in Pelotas on adults aged 20 to 69 years showed that those with lower family income presented a higher risk of asthma symptoms than did those with higher family income, both in the crude analysis

and in the adjusted analysis.¹¹ In another cohort study carried out in Pelotas, the prevalence of wheezing in the chest was greater among the young people of low socioeconomic level, both during childhood and at the start of adolescence.^{6,12} In a previous follow-up on this cohort¹⁰ that was conducted at the time of the military call-up for the young men, the frequency of wheezing in the chest was greater among those of high family income. These data are concordant with the “hypothesis of hygiene”, which proposes that infec-

tions during childhood may provide protection against asthma during adulthood. In the present analysis, which was conducted among individuals of both sexes five years after the latter, the association between family income and wheezing in the chest was in the opposite direction. In the earlier paper, a hypothesis of information bias was raised, given that reports on asthma could be different between young people of high and low socioeconomic level.¹⁰ By cross-referencing the reports from the two interviews, among individuals who said at the military interview that they had had wheezing in the chest during the past year, the following percentages reported wheezing in 2004-5: 55.4% of the lowest tercile of income, 45.4% of the middle tercile and 42.7% of the highest tercile. This suggests that some young men with high income erroneously said that they had wheezing at the time of the military call-up, possibly to avoid recruitment. This bias may explain the discrepancy between the results.

The effect of changes of income on the frequency of wheezing in the chest showed that individuals exposed to poverty, whether during childhood or during adulthood, presented greater risk. It was not possible to detect whether exposure to poverty during childhood was more harmful than exposure during adulthood, or vice versa.

The study among the recruits also showed that prolonged breastfeeding increased the risk of wheezing in the chest,¹⁰ which was not confirmed in the present analysis. On the other hand, recent meta-analyses have shown that breastfeeding has a protective effect or no effect on occurrences of asthma.^{7,14}

It was decided to present the analysis with stratification by sex, given that a recent paper showed that the risk factors for wheezing in the chest among adolescents aged 10 to 12 years were very different between boys and girls.¹² However, among young adults, little difference in the risk factors for wheezing was detected between men and women.

Some limitations of the present study must be taken into consideration. The diagnosis of asthma was based on symptoms of wheezing in the chest, which although being a good indicator for occurrences of asthma, do not constitute a confirmed diagnosis. However, there is no gold-standard method for diagnosing this disease. The symptom of wheezing in the chest is used internationally and has been shown to be the best option for epidemiological studies. Furthermore, although a recall period of 12 months was used, as recommended in the literature, there is the possibility of some degree of memory bias.

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