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Trends in the Prevalence of Asthma Symptoms and Allergic Diseases in Israeli Adolescents: Results from a National Survey 2003 and Comparison with 1997

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Purpose. To investigate the temporal trends in the prevalence of asthma symptoms and allergies in Israeli adolescents. **Methods.** A modified version of the International Study of Asthma and Allergies in Childhood questionnaire was administered to a national sample of Jewish and Arab schoolchildren in Israel. The results were compared to a similar survey conducted in 1997. **Results.** Asthma prevalence was 7.0% in 1997 and 6.4% 2003 respectively ($p = 0.1$). Wheezing in the past 12 months decreased significantly from 17.9% in 1997 to 13.8% in 2003 ($p < 0.001$). Allergic rhinitis and atopic dermatitis increased from 9.4% to 10.5%, and from 5.9% to 8.7% respectively. The prevalence of allergic disease remained higher in Jewish compared with Arabs. **Conclusions.** The prevalence of asthma symptoms decreased in Israel from 1997 to 2003 while there was an increase in allergic rhinitis and atopic dermatitis.

Keywords asthma, allergic diseases, symptoms, International Study of Asthma and Allergies in Childhood, adolescents, trends

INTRODUCTION

An increase in the incidence of asthma and allergies has been documented in the last decades (1–5). However, a number of studies reported that the rate may have reached a plateau (6–8).

In 1997 we used the protocol of the International Study of Asthma and Allergies in Childhood (ISAAC) (9) to investigate the prevalence of asthma and allergies in schoolchildren in Israel. Among the main findings were significantly higher rates of asthma and allergies in Jewish compared with Arab children (10, 11). Population group was a significant predictor of asthma even after adjustment for other risk factors (12).

The aim of the present study was to investigate temporal trends in the prevalence of asthma symptoms and allergies in Jewish and Arab schoolchildren and to evaluate risk factors associated with asthma and asthma symptoms.

MATERIAL AND METHODS

Sample

The data were collected in the second national study of the prevalence of asthma and allergies in 13–14-year-old schoolchildren in Israel carried out during the last 2 weeks

of May 2003. One hundred and nine schools were chosen at random from a list of all junior high schools in the country, provided by the Ministry of Education. Each school was considered a sampling unit, and for each unit sampled, all children attending its eighth grade were included in the study. The number of schools selected from each district was weighted for the total number of eighth-grade pupils in that district and the number of children attending each school. Since Jews and Arabs generally attend separate schools, sampling was done for each population group separately. For technical reasons, we did not sample ultraorthodox Jews who comprise 5% of the Jewish population and who attend a specialized school system. This study was carried out in collaboration with the Ministry of Education. The parents of the children in the selected schools received an explanatory letter with a reply slip to return if they did not want their child to participate in the study. Children who were absent from school on the day of the study were asked to complete the questionnaire on a specified day during the following month. Findings on the prevalence of asthma, asthma symptoms, allergic rhinitis and dermatitis, overall and by categories of sex, religion (Jews/Arabs), and place of residence (urban/rural), were compared with the data from the 1997 study.

Questionnaire

The standard written core questionnaire for wheezing and asthma, developed by the International Study of Asthma and Allergies in Childhood (ISAAC) (9) was used in the present

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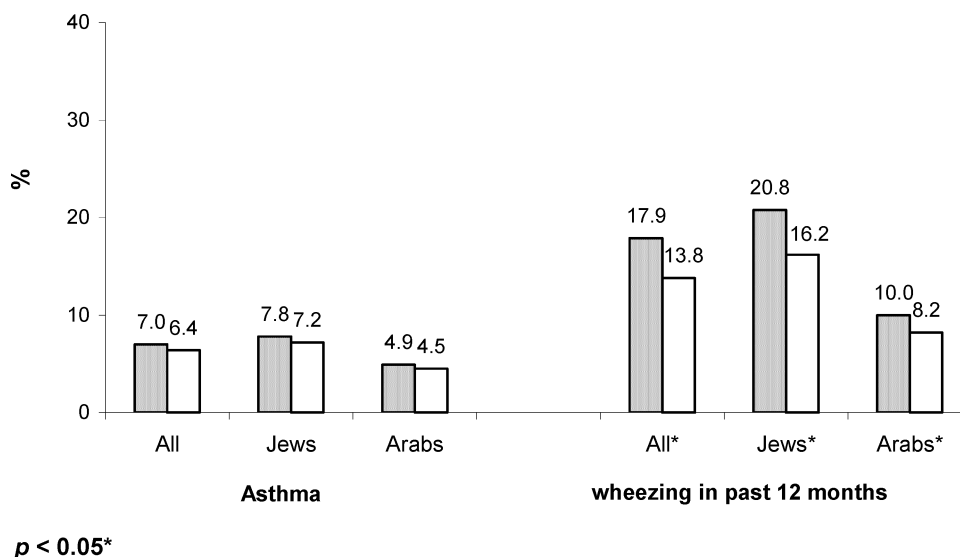


FIGURE 1.—Trends in the prevalence of asthma and wheezing in Arabs and Jews [1997 (□) vs (■) 2003].

study and in a similar study conducted in 1997. In both studies we added an item on current diagnosis of asthma and several items on demographic and social factors. All questionnaires were filled out anonymously in class. Teachers were instructed not to help the children with the answers.

Definitions

Children who answered “yes” to the question, “Do you have asthma or spastic bronchitis?” were considered to have “asthma.” Children who reported having ever had itchy rash in a typical distribution were considered “positive for atopic dermatitis.” Children who answered “yes” to the question, “Do you have allergic rhinitis?” were considered to have “allergic rhinitis.” Areas of residence with fewer than 2,000 inhabitants were considered “rural,” and those with 2,000 or more were considered “urban,” in accordance with the definition of the Israel Ministry of Interior Affairs.

Statistical Analysis

Statistical analyses were performed using the SAS package (version 8.2, SAS, Cary, NC). Comparisons of the prevalence of asthma and allergy by population group, sex, place of residence, and year of study were performed with chi-square test, and odds ratios were calculated. Multivariate logistic regression models controlling for possible confounders were used to evaluate variables associated with asthma, and adjusted odds ratios (ORs and 95% confidence intervals) were calculated.

RESULTS

Response Rate

The initial sample included 14,603 schoolchildren from 109 schools. After we excluded 1,403 children from 12 schools that refused to take part in the study, the revised sample consisted of 13,200 schoolchildren from 97 schools. Of these, 11,255 filled out the questionnaire, for an overall response rate of 82.9%. The Arab children had a higher response rate than the Jewish children (86.2% vs. 80.8%). For

the analyses, we excluded an additional 313 questionnaires that were largely incomplete and 1,587 questionnaires submitted by Druze and Bedouin children, leaving 9,382 eligible questionnaires: 6,738 (71.8%) from Jews and 2,644 (28.2%) from Arabs.

Temporal Trends of Asthma, Asthma Symptoms and Allergies

There was a slight, insignificant decrease in the prevalence of asthma between 1997 and 2003 (7.0% vs. 6.4%, $p = 0.1$) (Figure 1). Analysis by population group yielded a 7.8% rate of asthma among Jewish children in 1997 compared to 7.2% in 2003 ($p = 0.2$), and a 4.9% rate of asthma among Arab children in 1997 compared to 4.5% in 2003 ($p = 0.6$). In both years, asthma was 60% more common in Jews than in Arabs [7.8% vs. 4.9% in 1997, OR = 1.64 (95% CI 1.35–2.04, $p < 0.0001$); and 7.2% vs. 4.5% in 2003, OR = 1.66 (95% CI 1.35–2.04; $p < 0.0001$)]. These findings are shown in Table 1.

There was a significant decrease in the prevalence of asthma symptoms, including wheezing in the past 12 months, having 4 attacks or more of wheezing in the past 12 months, and in exercise-related wheezing. This was true for the whole study population and for each population group (Figure 1, Table 1). The decrease in wheezing in the past 12 months was more marked in Jews than in Arabs (20.8% to 16.1%, $p < 0.001$ and 10.0% to 8.2%, $p = 0.01$, respectively). The magnitude of the difference between Jews and Arabs was similar in both surveys (Table 1).

The change in the prevalence of allergies between 1997 and 2003 is shown in Figure 2. There was a significant increase in the prevalence of allergic rhinitis in Arabs, and an increase in atopic dermatitis in both population groups. In Jews, the rate of allergic rhinitis remained unchanged (10.7% and 10.4%); in Arabs it increased from 6.0% to 10.6%. Atopic dermatitis increased from 6.7% to 10.0% ($p < 0.001$) in Jews, and from 3.6% to 5.4% ($p < 0.001$) in Arabs. Jewish children had significantly higher rates of atopic dermatitis than Arab children in both surveys ($p < 0.0001$) (Table 1).

TABLE 1.—Prevalence of asthma, asthma symptoms and allergies by population group and year of study.

Year of study	1997				2003			
Population group	Jews	Arabs	OR(95%CI)	P	Jews	Arabs	OR(95%CI)	p
Subjects (n)	7436	2621			6334	2644		
Asthma (%)	7.8	4.9	1.64 (1.35–2.04)	<0.0001	7.2	4.5	1.66 (1.35–2.04)	<0.0001
Wheezing in the past 12 months (%)	20.8	10.0	2.30 (2.04–2.77)	<0.0001	16.1	8.2	2.08 (1.81–2.50)	<0.0001
>4 attacks of wheezing in the past 12 months (%)	5.8	2.7	2.17 (1.69–2.77)	<0.0001	4.1	2.2	1.92 (1.45–2.56)	<0.0001
Exercise related wheezing in the past 12 months (%)	22.8	9.3	2.86 (2.50–3.33)	<0.0001	19.0	9.1	2.32 (2.0–2.70)	<0.0001
Allergic rhinitis (%)	10.7	6.0	1.9 (1.57–2.3)	<0.0001	10.4	10.6	0.98 (0.84–1.14)	0.8
Atopic dermatitis (%)	6.7	3.6	1.93 (1.53–2.43)	<0.0001	10.0	5.4	1.96 (1.63–2.38)	<0.0001

RISK FACTORS FOR ASTHMA BY POPULATION GROUP

The prevalence rates and the crude odds ratios for asthma by selected risk factors by population group are shown in Table 2. Living in a rural area was associated with a lower rate of asthma than living in an urban area, but the difference was not statistically significant. Jewish children reported a positive history of asthma among their parents significantly more often than Arab children (20.2% and 17.2%, respectively, $p < 0.001$). On multivariate analysis, after adjustment for various risk factors, male sex, family history, and maternal smoking remained significant in the Jewish population, while male sex and family history of asthma remained significant in the Arab population (Table 3). The factors significantly associated with wheezing in the past 12 months in Jews were male sex, parental history of asthma, maternal smoking, and low paternal education; In Arabs these were male sex, parental history of asthma, and low maternal education.

DISCUSSION

In the present survey conducted in 2003 we evaluated the prevalence of asthma, asthma symptoms and allergies in schoolchildren in Israel, using a similar methodology and population as in 1997. While there was no significant change in the prevalence of asthma in Jews or Arabs, a significant decrease was found in parameters of asthma severity such as wheezing in the past 12 months, having 4 attacks of wheezing or more in a year, and exercise-related wheezing. This might be explained by a better control of the disease through educational measures and improved preventive treatment. These

findings are supported by other studies that used the ISAAC questionnaire.

In Australia, a 26% decrease in wheezing in the past 12 months was found in younger children between 1993 and 2002 (13). Wong et al. (14) reported a decrease in asthma symptoms in schoolchildren in Hong Kong between 1994–1995 and 2002, although the prevalence of physician-diagnosed asthma did not change. In Spain, the prevalence of current wheeze in 13–14-year-old children did not change from 1994–1995 to 2002–2003 (15), and in Belgium, there was no clear change in asthma, but wheeze decreased from 1996 to 2002 (16). In Italy, the prevalence of asthma in males and females increased significantly from 1974 to 1992 and then remained stable until 1998. The authors suggested that certain environmental factors related to lifestyle would continue to induce asthma symptoms in genetically predisposed children but that the process was self-limiting (6). Several other studies from Britain, Germany, and Denmark conducted in the last decade reported contrary findings of an increase in the prevalence of asthma and of wheeze in the past 12 months (17–19).

Significant differences between Jews and Arabs in the prevalence of asthma, asthma symptoms, and allergies were found in both 1997 and 2003 (10, 11). El-Sharif et al. (20) reported a low rate of asthma (5.9%) in 12–15-year-old Palestinian schoolchildren, similar to the rate found in Arab children in the present study (4.5%). Together, these data support the possibility that genetic factors are important in the pathogenesis of asthma and may explain the observed differences between Jews and Arabs.

There was no change in the prevalence of allergic rhinitis in Jews, and an increase in Arabs; a significant increase in

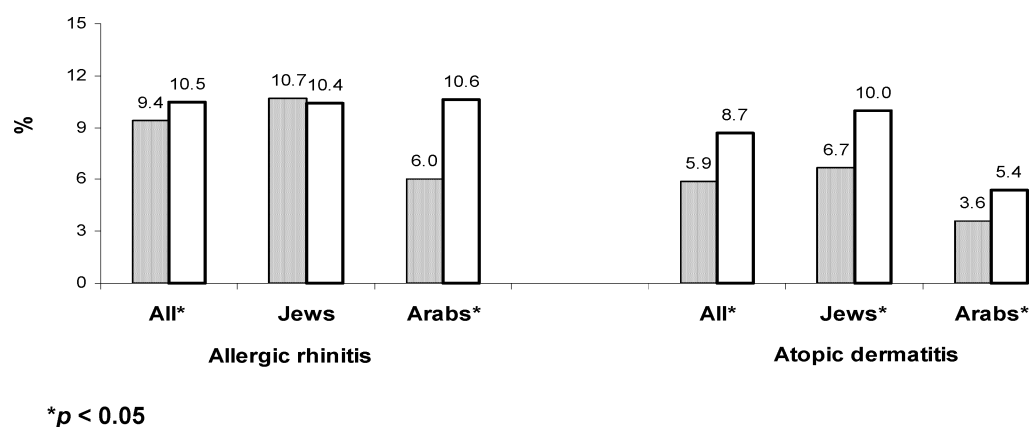


FIGURE 2.—Trends in the prevalence of allergic rhinitis and atopic dermatitis in Jews and Arabs [1997 (■) vs 2003 (□)].

TABLE 2.—Risk factors for asthma among Jewish and Arab schoolchildren.

Risk factors	Jews			Arabs		
	%	OR (95%CI)	P	%	OR (95%CI)	P
Sex						
Male	8.4	1.40 (1.16–1.72)	0.0004	5.6	1.75 (1.19–2.50)	0.004
Female	6.2			3.3		
Area of residence						
Urban	7.5	1.30 (0.97–1.74)	0.07	4.6	3.19 (0.78–13.10)	0.09
Rural	5.8			1.5		
History of asthma in parents						
Yes	20.2	3.85 (3.02–4.90)	<0.0001	17.2	5.39 (3.30–8.70)	<0.0001
No	6.2			3.7		
Maternal smoking						
Yes	8.6	1.30 (1.05–1.59)	0.01	7.1	1.69 (0.80–3.56)	0.2
No	6.7			4.4		
Paternal smoking						
Yes	7.9	1.15 (0.94–1.40)	0.15	4.6	1.14 (0.77–1.69)	0.5
No	6.9			4.0		
Crowding (no. per room)						
≤1	7.5	1.09 (0.89–1.35)	0.4	4.7	1.12 (0.74–1.70)	0.6
>1	7.0			4.2		
Presence of older siblings						
≤3	7.2	0.98 (1.28–1.75)	0.8	4.3	0.9 (0.60–1.30)	0.5
>3	7.4			4.8		
Paternal education						
≥12	6.0	0.7 (0.50–0.94)	0.01	3.1	0.7 (0.45–1.10)	0.1
>12	8.4			4.3		
Maternal education						
≥12	6.4	1.09 (0.7–1.61)	0.8	2.8	0.60 (0.38–0.93)	0.01
>12	6.1			4.7		

atopic dermatitis was observed in both groups. Accordingly, no increase in asthma, hay fever or atopic sensitization was found in adolescents living in Switzerland (7), although in Germany, there was a mild increase in the prevalence of atopic dermatitis and a significant increase in asthma and allergic rhinitis (18). In Brazil, the prevalence of symptoms of asthma, probable asthma and dermatitis did not change from 1995 to 2001, but there was a 23.7% increase in the prevalence of rhinoconjunctivitis symptoms (21). Similarly, in Estonia, the prevalence of respiratory symptoms remained unchanged over an 8-year period, but there was a modest increase in seasonal allergic rhinitis and dermatitis (22).

In the present study, analysis of the risk factors for asthma showed that parental history of asthma was the most significant risk factor in both groups. Although the Arab children reported lower prevalence rates of parental asthma than the Jewish children, the adjusted odds ratio associated with parental history was slightly higher in the Arabs (5.40 versus 3.85). This may be related to the high rate of consanguineous marriages (up to 35%) in the Arab population in Israel (23).

Male sex was also a significant risk factor for asthma in both groups. The published data on the relationship between sex and allergic diseases are inconsistent (24, 25). This could

be related to physiologic differences, but cultural differences probably influence behaviors of denial and unintentional discrimination. Social influences may lead to over- or under-reporting of symptoms in either sex (25, 26).

Maternal smoking was a significant risk factor for asthma in Jews but not in Arabs. This is related to the known difference in smoking habits between the two populations (27). In the present study, 20% of the Jewish mothers were smokers compared to only 2% of the Arab mothers. We speculate that although the persistently low rates of asthma in Arab children support a major role of genetic factors in the pathogenesis of allergic diseases, the introduction of environmental elements, such as maternal smoking, may contribute to the manifestations and rate of asthma, as shown in the Jewish population.

Our results are based on the responses of young teenagers who may not have reported their symptoms accurately. Nevertheless, in a previous study, self-reports of children of respiratory symptoms were shown to be more valid than parental reports (28). Although the time interval between the two surveys was relatively short, we believe it was sufficient to detect major changes, if any, in trends.

In summary, the present study indicates stabilization in the prevalence of asthma in Israeli adolescents, a decrease in asthma symptoms, and an increase in the prevalence of allergic rhinitis in Arabs and increase in atopic dermatitis both in Jews and Arabs. The low rate of asthma in the Arab population is in consistence with previous studies and may be partially explained by genetic factors and low rate of maternal smoking.

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TABLE 3.—Adjusted odds ratios for asthma in Jewish and Arab schoolchildren.

	Odds ratio	95% CI	P
Jews risk factor			
Sex male	1.39	1.13–1.70	0.001
History of asthma in parents	3.80	2.92–4.9	<0.0001
Maternal smoking	1.34	1.07–1.67	0.009
Paternal education <12	0.84	0.63–1.11	0.22
Arabs risk factor			
Sex male	1.82	1.23–2.68	0.002
History of asthma in parents	5.43	3.34–8.82	<0.0001
Maternal education <12	0.65	0.44–0.96	0.03

* <0.05 * <0.05

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