Prevalence of asthma - associated symptoms in Turkish children

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SUMMARY : Türktaş İ, Selçuk ZT, Kalyoncu AF. Prevalence of asthma-associated symptoms in Turkish children. Turk J Pediatr 2001; 43: 1-11.

The aim of the first national cross-sectional survey was to determine the prevalence of asthma-like respiratory symptoms and the associated risk factors among children aged 0-17 via interview with the parents by primary care physicians. They were selected through stratified two-stage cluster probability sampling in urban and rural parts of randomly selected 27 of 81 administrative districts in Turkey.

Data was collected for 46,813 children (23,512 males and 23,301 females) of whom 66 percent resided in urban areas. The prevalence of physician-diagnosed asthma was 0.7 percent. The lifetime and current (last 12 months) prevalences were 14.7 percent and 2.8 percent for asthma, and 15.1 percent and 3.4 percent for wheezing respectively. The presence of personal atopy and history of family atopy were the most significant risk factors for current prevalences of wheezing, and asthma [adjusted Odds ratios (OR) and 95% confidence intervals (CI) were 6.2 (CI=4.0-9.5) and 1.8 (CI=1.3-2.4) for wheezing, and 8.5 (CI=5.6-12.9) and 1.9 (CI=1.4-2.5) for asthma, respectively]. Though there were no significant differences among those residing in urban versus rural areas regarding the current prevalences of asthma and wheezing, those living in coastal areas had considerably higher current prevalences than those inland (OR=2.6, CI=1.9-3.5 for wheezing, and OR=2.3, CI=1.7-3.1 for asthma). Residence in northern Turkey appeared to be a significant risk factor for wheezing (OR=1.9, CI=1.4-2.5), and children resident in southern Turkey exhibited the highest risk for occurrence of asthma (OR=1.5, CI= 1.1-2.0) compared with eastern Turkey.

In conclusion, the respiratory symptoms associated with asthma were an important cause of morbidity in childhood in Turkey. The discrepancy between prevalence of physician-diagnosed asthma and lifetime and/or current asthma prevalence figures may reflect the reluctancy of both physicians and parents to diagnose this condition. Besides strongest associations with personal atopy and atopic heredity, there were significant differences in prevalence rates between children residing in different regions, supporting the role of environmental factors.

Key words: childhood asthma, Turkey, ISAAC, epidemiology.

Bronchial asthma is among the most common chronic diseases of childhood. Recent surveys indicate a significant increase in the prevalence of asthma and other allergic diseases worldwide. Despite advances in both the diagnosis and treatment of bronchial asthma in the last decades, the rise in its morbidity and mortality is rather disappointing. Given these facts, intensive research on the pathogenesis and augmented emphasis on preventive measures for allergic diseases appear justified. Epidemiological studies in children from different parts of the world have served well to discriminate the associated risk factors for asthma.

Profound variations in prevalence figures for bronchial asthma exist between populations in different countries and even in regions within the same country. The criteria of the International Study of Asthma and Allergies in Childhood (ISAAC) have been proposed for questionnaire surveys to allow international comparison of prevalence figures[1]. A video version of the questionnaire was also developed to overcome translation problems and cultural background differences present even among those speaking English in different countries or locations[2]. The surveys among children in western countries

show a trend of increased prevalence, up to 20 percent, yet the figures are much lower in east European and Asian countries[3].

Several epidemiological studies on bronchial asthma have been conducted recently in various parts of Turkey via different methodologies (Table I)[4-18]. The ISAAC questionnaire was also successfully employed in a number of these surveys[13-18]. The reported figures for childhood asthma prevalence generally fall somewhere in between those seen in eastern and western populations. Though there are evident differences in the prevalence figures, it is rather inconvenient to draw conclusions due to disparate methodologies and ages of the study groups.

Table I. Prevalence of Asthma in Children in Different Provinces in Turkey

Province	n	Year	Age	Cumulative (%)	Current (%)	Questionnaire type	Reference no.
Ankara	3024	1991	6-13	6.9	–	ATS[a]	6
İzmir	3512	1992	6-13	4.9	–	ATS[a]	7
Bursa	3055	1993	6-12	7.8	–	ATS[a]	8
Samsun	3118	1993	6-14	8.2	–	ATS[a]	9
Ankara	1036	1992	6-12	17.4	8.3	N.Aberg[b]	10
Edirne	5412	1994	7-12	16.4	5.6	N.Aberg[b]	11
Ankara	738	1997	6-13	16.8	9.8	N.Aberg[b]	12
İstanbul	2232	1995	6-12	9.8	–	ISAAC[c]	13
Ankara	2784	1996	7-14	8.1	–	ISAAC[c]	14
Germany	470	1996	9-13	6.4	–	ISAAC[c]	15
Samsun	3090	1996	6-13	14.5	–	ISAAC[c]	16
Adana	4114	1997	12-17	2.8	–	ISAAC[c]	17
Northern Cyprus	2529	1997	6-14	11.4	–	ISAAC[c]	18

a) ATS: American Thoracic Society questionnaire (Ref. 4).
b) Aberg N (Ref. 5).
c) ISAAC: International Study of Asthma and Allergies in Childhood (Ref. 1).

A nationwide survey of children in different parts of the country to investigate the prevalence figures of bronchial asthma, associated respiratory symptoms, and also risk factors was conducted in 1996. In order to permit international and national comparison of figures for the same age groups, a questionnaire based on the ISAAC protocol was employed. This report summarizes the results of this first national survey on childhood bronchial asthma and wheezing.

Material and Methods

Study Population

The first nationwide survey of chronic childhood diseases among those aged 0 to 17 was conducted in 1996. A stratified two-stage cluster probability sample design was used in this epidemiological study[1]. Five strata were determined on the basis of the region, median income and other social and demographic characteristics. After stratification by five major geographical regions (MGRs) of Turkey (east, west, north, south and central), the two stages of sample selection were primary districts (PDs) and residence units (RUs), in hierarchical order. PDs are cities composed of both rural and urban subdistricts.

Since the variance of the estimate of prevalence was expected to be influenced when complex designs (particularly cluster sampling) were used in surveys, a design effect value of 2.0 was decided for this survey while calculating the effective sample size. The total sample size was determined in order to estimate the lowest assumed prevalence of 0.015 percent[19]. The estimated child population aged 0 to 16 in 1996 was 24,773,569 based on the National Census in 1985 and 1990[20,21]. Among the 81 administrative districts, 27 were selected, including the five most populated districts and 22 randomly selected ones (Fig. 1). Thus, one-third of the total 81 districts were included in the study. The estimated total population of children in the same age group was 15,332,748 in these 27 districts. In regard to type I and II errors of 0.05 and 0.10, respectively, a power of 90 percent and effect size of 2, the optimum sample size for this survey was calculated as 50,000.

The total sample size for each MGR was proportionately allocated to selected PDs and then further stratified into the rural and urban subdistricts. The address list obtained from the

1990 National Census was used as the sampling frame to determine the RUs, i.e. street names for urban and village names for rural areas. Cluster size was planned as 20 children.

and Zonguldak in June 1996. The questionnaire was considered appropriate and valid after these pilot studies and revisions.

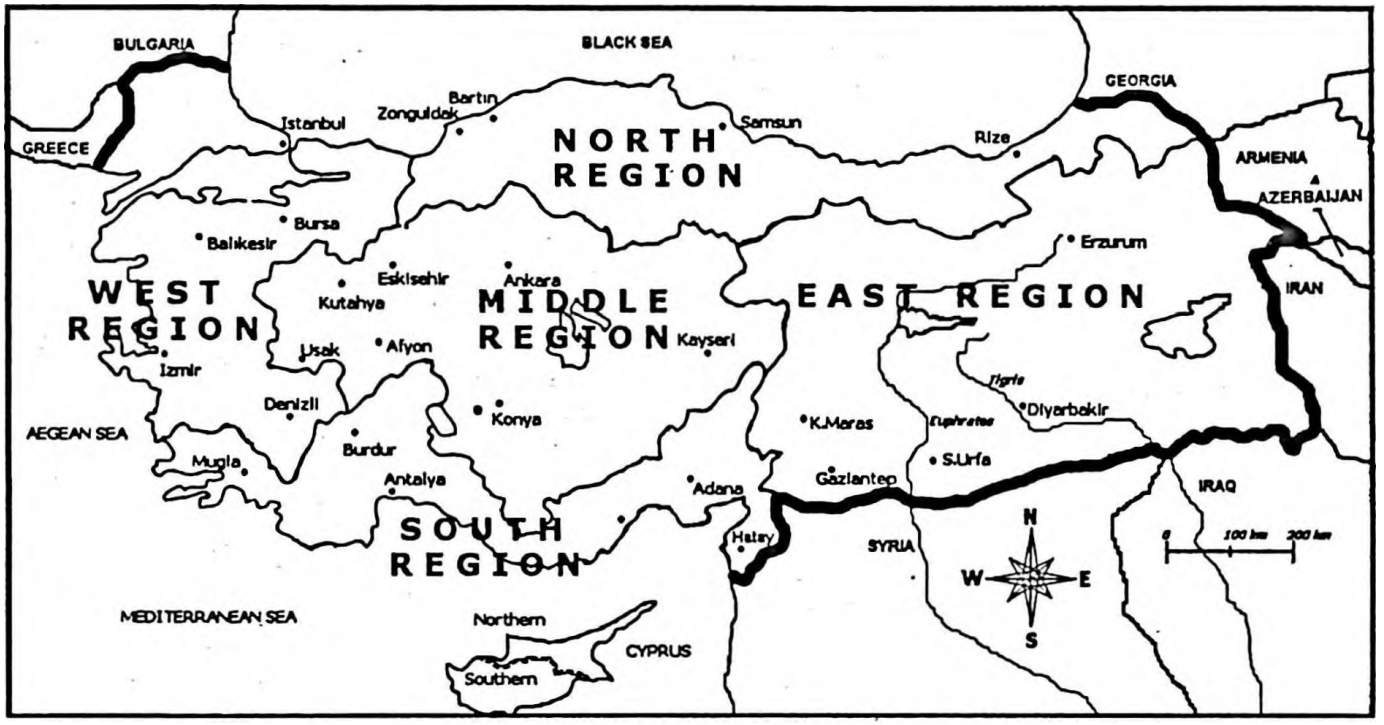

Fig. 1. Map of Turkey showing the locations in which the survey was conducted.

Data Collection

The major questionnaire on chronic diseases of childhood included 60 pages with different modules in Turkish. The questions employed to determine the prevalence rates of asthma and wheezing were derived from the ISAAC protocol in English; minor modifications were made in order to increase the comprehension and clarify questions that might arise from translation problems and cultural differences. Though there is no exact equivalent of "wheezing" in Turkish, phrases successfully employed in previous questionnaire surveys were used[10,11]. The questions employed are included in the Appendix. Apart from those questions regarding the presence of asthma and wheezing in children, a number of other questions about atopic heredity, and social and economical status of the family were included in the general questionnaire. The draft questionnaire underwent a pilot study on 300 children in 10 randomly selected streets of metropolitan Ankara, and also on 40 in- and outpatients of some health institutions. The questionnaire was modified, and underwent a second trial including 300 children randomly selected in Antalya, Bursa, İstanbul, Diyarbakır

One hundred and forty-six primary care physicians from different regions in the country were specially trained for a total of 10 weeks for administration of the questionnaire prior to its use in the survey. Another eight primary care physicians were also employed as supervisors in the field. After validation of the questionnaire and approval of the supervisors for the physicians, the survey began in July 1996 and was completed in October 1996. The questionnaire modules were applied and completed by the trained physicians under supervision at different times and locations during the whole course of the survey. After collection of the first 10,000 questionnaires, 1. in every 20 questionnaires was selected, and a phone call was made to the responders to confirm that the home visit was made and that the questionnaire was completed as required. They were questioned as to the date of the visit, whether there were children at home on that date, and whether they had been examined. The responses of the parents to some 10 to 15 randomly selected questions in the modules were compared with the written responses in the filled form.

Definition of Outcomes

The subjects were grouped as residing in either inland or coastal regions, and in rural or urban areas according to their place of habitation. The place of habitation was also divided into five geographical regions (east, west, north, south and central). The prevalence figures were calculated both for the administrative districts and for the five geographical regions.

The lifetime and current occurrences of wheezing and asthma was defined according to the questionnaire responses by the parents as follows (see Appendix) The presence of wheezing or asthma were determined in regard to combinations of responses to different questions rather than from single ones. If a wheezing or asthma attack had occurred in the past, if the child had become wheezy after exercise or during a cold or bronchitis, or if his speech was limited or sleep disturbed by wheezing, it was regarded as the occurrence of wheezing any time in the past (lifetime wheezing) (Questions 1, 3-6 and 13). If any of these wheezing episodes was observed during the last 12 months, the child was regarded as having current wheezing (Questions No. 3-6). If the parents had responded positively to at least two of the first 14 questions, excluding morning phlegm (Question 8), the child was considered to have asthma any time in the past (lifetime asthma). Since most of the pediatric patients with bronchial asthma were given the diagnosis of either "bronchitis" or "allergic bronchitis", a past history of bronchitis (Question 12) was also included for definition of lifetime asthma. If the parents answered positively to at least two of the questions, inquiring about respiratory symptoms, use of bronchodilator drugs or presence of recurrent/ persistent cough during the last 12 months (Questions 3-10 and Question 14 were included, and Question 8 was excluded), then the child was regarded as having asthma in the last 12 months (current asthma). Those children diagnosed with possible bronchial asthma were referred to the nearest health center for further evaluation.

Statistical Analysis

Prior to analysis, the data entry (responses to the questionnaires) was checked by double entry. Comparisons were made by chi-square test. Statistical analysis was performed via statistical software package SPSS for Windows version 7.5. Adjusted odd ratios (ORs) and 95% confidence limits (95% CI) for risk factors were obtained from multiple logistic regression models for asthma and wheezing. P values below 0.05 were considered statistically significant.

Results

A total of 46,813 children were surveyed during the study (93.6 % of the aimed 50,000 population). The study group included 23,512 boys (50.2%) and 23,301 girls (49.8%), of whom 66 percent resided in urban and 34 percent in rural areas. The majority of the study group were living inland (56.6%). The demographic characteristics of the study group are presented in Table II.

Table II. Demographic Characteristics of the Study Group

Age (years)	Boys n (%)	Girls n (%)	Total n (% of total)
<1	1500 (6.4)	1420 (6.1)	2920 (6.2)
1	1508 (6.4)	1410 (6.1)	2918 (6.2)
2	1452 (6.2)	1357 (5.8)	2809 (6.0)
3	1572 (6.3)	1374 (5.9)	2846 (6.1)
4	1537 (6.5)	1462 (6.3)	2999 (6.4)
5	1529 (6.5)	1484 (6.4)	3013 (6.4)
6	1544 (6.6)	1509 (6.5)	3053 (6.5)
7	1505 (6.4)	1504 (6.5)	3009 (6.4)
8	1408 (6.0)	1533 (6.6)	2941 (6.3)
9	1518 (6.5)	1491 (6.4)	3009 (6.4)
10	1463 (6.2)	1385 (5.9)	2848 (6.1)
11	1428 (6.1)	1498 (6.4)	2926 (6.3)
12	1353 (5.8)	1379 (5.9)	2732 (5.8)
13	1228 (5.2)	1304 (5.6)	2532 (5.4)
14	1116 (4.7)	1206 (5.2)	2322 (5.0)
15	1210 (5.1)	1202 (5.2)	2412 (5.2)
16	662 (2.8)	701 (3.0)	1363 (2.9)
17	63 (0.3)	62 (0.3)	125 (0.3)
Unknown	16 (0.1)	20 (0.1)	36 (0.1)
Place of habitation			
Rural	8048 (34.2)	7875 (33.8)	15923 (34.0)
Urban	15464 (65.8)	15426 (66.2)	30890 (66.0)
Region			
West	6067 (28.8)	6595 (28.3)	13362 (28.5)
South	3173 (13.5)	3209 (13.8)	6382 (13.6)
Central	5145 (21.9)	5188 (22.3)	10333 (22.1)
North	2008 (8.5)	2084 (8.9)	4092 (8.1)
East	6419 (27.3)	6225 (26.7)	12644 (27.0)
Inland	13387 (56.9)	13105 (56.2)	26492 (56.6)
Coastal	10125 (43.1)	10196 (43.8)	20321 (43.4)
Total	23512 (50.2)	23301 (49.8)	46813 (100)
Personal atopy	81 (0.3)	99 (0.4)	180 (0.4)
Family atopy	542 (2.3)	508 (2.2)	1050 (2.2)
Smoking at home	16318 (86.5)	16174 (86.3)	32492 (86.4)
Socioeconomic status			
low	8699 (38.2)	8506 (37.8)	17205 (38.2)
moderate	46666 (20.5)	4683 (20.8)	9349 (20.7)
high	9394 (41.3)	9318 (41.4)	18712 (41.3)

The prevalences of respiratory symptoms, risk factors and use of bronchodilators are depicted in Table III. All respiratory symptoms as well as "ever wheezing" and "physician-diagnosed asthma" were significantly more frequent among males than females in the overall group. There were no differences between sexes for personal or family history of atopy, exposure to cigarette smoke at home and socioeconomic status. Information about smoking at home was obtained for 37,600 children (80.3 %). There was at least one smoker at home for 32,492 children (86.4%). There was only one smoker at home for 22,925 children (61.0 %), two smokers for 7,400 (19.7%), three smokers for 1,442 (3.8 %) and four or more smokers four 725 children (1.9 %).

Table III. Respiratory Symptoms

	Boys (%)	Girls (%)	Total (%)
Ever wheezing*	1968 (8.4)	1546 (6.7)	3514 (7.6)
Physician-diagnosed asthma*	222 (1.0)	115 (0.5)	337 (0.7)
SYMPTOMS DURING THE LAST 12 MONTHS			
Wheezing or asthma attack*	561 (24)	416 (1.8)	977 (2.1)
Waking with cough/wheezing*	515 (2.2)	368 (1.6)	883 (1.9)
Attack of wheezing limiting speech*	178 (0.8)	107 (0.5)	285 (0.6)
Wheezing after exercise*	359 (1.5)	223 (1.0)	582 (1.2)
Coughing at night*	660 (2.8)	550 (2.4)	1210 (2.6)
Morning phlegm*	558 (2.4)	419 (1.8)	977 (2.1)
Morning chest tightness*	203 (0.9)	137 (0.6)	340 (0.7)
Chest tightness and/or shortness of breath after exposure to allergens*	197 (0.8)	140 (0.6)	337 (0.7)
Use of bronchodilators*	384 (1.6)	256 (1.1)	640 (1.4)
Ever bronchitis*	4993 (21.3)	4149 (17.9)	9142 (19.6)
Wheezing with cold/bronchitis*	3546 (15.2)	2829 (12.2)	6375 (13.7)
Recurrent or persistant cough for at least 12 months**	238 (1.1)	193 (0.9)	431 (1.0)

* $p<0.001$.
** $p<0.05$.

Prevalences of both asthma and wheezing according to either single questions or combined responses to various questions in regard to age and place of habitation are presented in Table IV and V. Parents of 3,514 children (7.6 %) stated they had observed their children with wheezing in the past (Appendix, Question 1). However,

Table IV. Prevalences of Lifetime and Current Wheezing and Asthma According to Age Groups in Children

	Wheezing			Asthma		
Age (years)	Ever[1]	Lifetime[2]	Current[3]	Physician-diagnosed[4]	Lifetime[5]	Current[6]
<1	193 (6.7)	332 (11.4)	127 (4.3)	10 (0.3)	324 (11.1)	66 (2.3)
1	341 (11.8)	605 (20.7)	206 (7.1)	23 (0.8)	583 (20.0)	158 (5.4)
2	281 (10.1)	518 (18.4)	152 (5.4)	23 (0.8)	500 (17.8)	125 (4.4)
3	258 (9.1)	504 (17.7)	127 (4.5)	24 (0.8)	500 (17.6)	111 (3.9)
4	289 (9.7)	548 (18.3)	129 (4.3)	30 (1.0)	536 (17.9)	102 (3.4)
5	256 (8.6)	498 (16.5)	107 (3.6)	24 (0.8)	480 (15.9)	93 (3.1)
6	254 (8.4)	501 (16.4)	110 (3.6)	27 (0.9)	495 (16.2)	89 (2.9)
7	240 (8.0)	500 (16.6)	105 (3.5)	22 (0.7)	470 (15.6)	82 (2.7)
8	225 (7.7)	450 (15.3)	84 (2.9)	20 (0.7)	433 (14.7)	81 (2.8)
9	195 (6.5)	433 (14.4)	90 (3.0)	24 (0.8)	423 (14.1)	77 (2.6)
10	196 (6.9)	397 (13.9)	74 (2.6)	24 (0.9)	394 (13.8)	58 (2.0)
11	154 (5.3)	368 (12.6)	53 (1.8)	16 (0.6)	360 (12.3)	47 (1.6)
12	162 (6.0)	354 (13.0)	64 (2.3)	16 (0.6)	349 (12.8)	53 (1.9)
13	130 (5.2)	294 (11.6)	40 (1.6)	23 (0.9)	280 (11.1)	39 (1.5)
14	130 (5.6)	305 (13.1)	39 (1.7)	14 (0.6)	294 (12.7)	46 (2.0)
15	121 (5.1)	275 (11.4)	45 (1.9)	11 (0.5)	266 (11.0)	36 (1.5)
16	81 (6.0)	174 (12.8)	23 (1.7)	5 (0.4)	176 (12.9)	24 (1.8)
17	8 (6.4)	11 (8.8)	2 (1.6)	1 (0.8)	11 (8.8)	4 (3.2)
Total	7069 (7.6)	1577 (15.1)	337 (3.4)	6876 (0.7)	1291 (14.7)	(2.8)

1. Positive response to Question no. 1 (Appendix).
2. A positive answer to any of Questions 1, 3, 4, 5, 6 and/or 13 was regarded as wheezing any time in the past (lifetime wheezing).
3. If the parents had answered positively to any the Questions 3, 4, 5 or 6, the child was regarded as having wheezing during the last 12 months (current wheezing).
4. Positive response to Question 2. (Appendix).
5. If any two of the answers to the first 14 Questions, except Question 8, in the questionnaire were positive, the child was considered to have asthma in the past (lifetime asthma).
6. If two or more of the answers to Questions 3, 4, 5, 6, 7, 9, 10, 11 or 14, were positive, the child was considered to have current asthma.

Table V. Prevalences of Cumulative and Current Wheezing and Asthma in Children According to the Place of Habitation

Region and Cities	Wheezing			Asthma		
	Ever	Lifetime	Current	Physician-diagnosed	Lifetime	Current
Inland	1510 (5.7)	3284 (12.4)	752 (2.8)	105 (0.4)	3275 (12.4)	571 (2.2)
Coastal	2004 (10.0)	3785 (18.6)	825 (4.1)	232 (1.2)	3601 (17.7)	720 (3.5)
Urban	2568 (8.4)	5037 (16.3)	1118 (3.6)	257 (0.8)	4910 (15.9)	938 (3.0)
Rural	946 (6.0)	2032 (12.8)	459 (2.9)	80 (0.5)	1966 (12.3)	353 (2.2)
NORTH						
Bartın	89 (23.7)	94 (24.9)	51 (13.5)	4 (1.1)	91 (24.1)	40 (10.6)
Zonguldak	92 (9.8)	180 (18.7)	58 (6.0)	9 (1.0)	124 (12.9)	43 (4.5)
Samsun	316 (14.0)	500 (22.0)	156 (6.9)	31 (1.4)	467 (20.6)	100 (4.4)
Rize	46 (9.6)	70 (14.5)	11 (2.3)	7 (1.5)	72 (14.9)	11 (2.3)
Regional	543 (13.4)	844 (20.6)	276 (6.7)	51 (1.3)	754 (18.4)	194 (4.7)
WEST						
İstanbul	983 (13.7)	1622 (22.4)	397 (5.5)	117 (1.6)	1556 (21.5)	377 (5.2)
Balıkesir	57 (7.0)	75 (9.2)	31 (3.8)	10 (1.2)	77 (9.4)	33 (4.0)
İzmir	301 (10.8)	435 (15.6)	71 (2.5)	22 (0.8)	415 (14.9)	70 (2.5)
Denizli	20 (2.4)	97 (11.6)	13 (1.5)	2 (0.2)	110 (13.1)	14 (1.7)
Bursa	30 (1.8)	141 (8.4)	14 (0.8)	6 (0.4)	145 (8.7)	12 (0.7)
Regional	1391 (10.5)	2370 (17.7)	526 (3.9)	157 (1.2)	2303 (17.2)	506 (3.8)
EAST						
K. Maraş	167 (9.2)	208 (11.4)	78 (4.3)	6 (0.3)	223 (12.2)	69 (3.8)
Ş. Urfa	187 (6.4)	283 (9.6)	145 (4.9)	17 (0.6)	317 (10.7)	100 (3.4)
Diyarbakır	97 (3.0)	295 (9.0)	80 (2.4)	9 (0.3)	323 (9.9)	89 (2.7)
Erzurum	89 (6.4)	135 (9.7)	31 (2.2)	3 (0.2)	127 (9.1)	25 (1.8)
G. Antep	22 (0.8)	349 (13.4)	26 (1.0)	4 (0.2)	339 (13.0)	20 (0.8)
Sivas	31 (5.2)	60 (10.0)	6 (1.0)	2 (0.3)	62 (10.4)	1 (0.2)
Regional	593 (4.7)	1330 (10.5)	366 (2.9)	41 (0.3)	1391 (11.0)	304 (2.4)
CENTRAL						
Ankara	366 (9.4)	717 (18.3)	206 (5.3)	20 (0.5)	640 (16.3)	119 (3.0)
Konya	223 (7.9)	381 (13.4)	69 (2.4)	12 (0.4)	377 (13.3)	52 (1.8)
Kütahya	15 (2.1)	206 (28.7)	7 (1.0)	5 (0.7)	204 (28.4)	7 (1.0)
Uşak	6 (1.5)	32 (7.9)	4 (1.0)	3 (0.7)	32 (7.9)	4 (1.0)
Kayseri	30 (2.4)	118 (9.2)	15 (1.2)	1 (0.1)	119 (9.3)	12 (0.9)
CENTRAL						
Afyon	142 (13.1)	145 (13.1)	21 (1.9)	4 (0.4)	140 (12.9)	9 (0.8)
Regional	790 (7.7)	1607 (15.6)	322 (3.1)	45 (0.4)	1520 (14.7)	203 (2.0)
SOUTH						
Antaly	58 (5.4)	195 (18.0)	34 (3.1)	8 (0.7)	189 (17.4)	28 (2.6)
Burdur	20 (10.5)	34 (17.9)	6 (3.2)	1 (0.5)	32 (16.8)	5 (2.6)
İçel	32 (2.5)	150 (11.4)	22 (1.7)	12 (0.9)	143 (10.9)	20 (1.5)
Hatay	11 (0.9)	58 (4.7)	10 (0.8)	7 (0.6)	56 (4.5)	11 (0.9)
Muğla	7 (1.5)	28 (6.0)	3 (0.6)	2 (0.4)	26 (5.5)	4 (0.9)
Adana	69 (3.4)	453 (21.6)	12 (0.6)	13 (0.6)	462 (22.1)	16 (0.8)
Regional	197 (3.1)	918 (14.4)	87 (14.4)	43 (0.7)	908 (14.2)	84 (1.3)

when responses to whether the child had experienced wheezing associated with physical exercise, or with a bronchitis or whether they had cold episode, or ever been disturbed by wheezing during speech or sleep were considered together with the response to the first question (combined definition for lifetime wheezing), the positive response rate increased two fold (7,069 children, 15.1%). The prevalence of current wheezing (occurrence of a wheezing attack, disturbance of sleep or speech by wheezing or wheezing associated with exercise during the last 12 months) was 3.4 percent. Asthma was previously diagnosed by physicians in 337 children (0.7%). However, the prevalence figure increased to 14.7 percent (6,876 children) provided lifetime asthma was diagnosed when there were at least two positive responses for the asthma associated symptoms (excluding phlegm production) or use of bronchodilator drugs. The prevalence of current asthma (presence of at least 2 asthma-associated symptoms during the last 12 months) was 2.8 percent (1,291 children). Prevalences of asthma and wheezing were higher in coastal and urban areas. The regional prevalences of both conditions were lowest in eastern Turkey, followed by the central region, and figures were highest in northern Turkey.

Presence of personal atopic history followed by family atopic history were the most prominent risk factors for both lifetime and current (last 12

months) occurrences of wheezing or asthma (Table VI). The risk became more apparent for the occurrences of these conditions during the last 12 months. Male gender and habitation in coastal areas were also risk factors for both asthma and wheezing. Living in urban areas rather than in rural areas was not a significant risk factor for current occurrences of either wheezing or asthma. Age had a minimal effect on the prevalences of these conditions. Indoor exposure to cigarette smoke was also a significant risk factor for both lifetime and current (last 12 months) occurrences of asthma and wheezing. Its presence did not affect the prevalence of physician-diagnosed asthma. Socioeconomic status did not appear as a significant risk factor for asthma and wheezing in childhood.

Discussion

This report summarizes the results on the prevalences of the respiratory symptoms associated with asthma incorporated within the nationwide chronic childhood diseases questionnaire survey in Turkey in 1996. Though several studies have been conducted previously in the urban areas of different cities in the country, comparison of the prevalence figures was not possible due to different methodologies (6-14, 16-18) (Table I). However, these reported prevalences are generally lower than those in most western countries. The results of the present survey provide prevalence figures for comparison between different communities in separate locations (rural vs urban, coastal vs inland, different regions and cities), and allow

Table VI. Adjusted Odds Ratios (OR) with 95% Confidence Intervals of Potential Risk Factors for Childhood Wheezing and Asthma*

	Wheezing			Asthma		
	Ever	Lifetime	Current	Physician-diagnosed	Lifetime	Current
Age	0.98 (0.97-0.98)	0.99 (0.98-0.99)	0.96 (0.95-0.96)	1.00 (0.98-1.02)	0.99 (0.99-099)	0.97 (0.96-0.98)
Sex (male)	1.25 (1.16-1.35)	1.25 (1.18-1.33)	1.32 (1.18-1.48)	2.00 (1.55-2.58)	1.26 (1.19-1.34)	1.39 (1.23-1.58)
Place of Habitation						
Urban	1.02 (0.91-1.14)	1.10 (1.02-1.20)	1.04 (0.89-1.23)	1.04 (0.72-1.49)	1.14 (1.04-1.23)	1.06 (0.89-1.28)
Coastal	3.95 (3.20-4.88)	2.38 (2.08-2.73)	2.59 (1.92-3.49)	2.24 (1.31-3.84)	2.11 (1.85-2.42)	2.31 (1.72-3.12)
Region						
West	1.21 (1.06-1.38)	1.19 (1.07-1.32)	1.67 (1.39-2.00)	1.29 (0.89-1.88)	1.08 (0.97-1.21)	1.26 (1.03-1.55)
South	1.56 (1.25-1.95)	1.28 (1.11-1.47)	1.83 (1.35-2.49)	0.64 (0.34-1.21)	1.23 (1.07-1.42)	1.50 (1.10-2.04)
Central	0.25 (0.21-0.30)	0.69 (0.62-0.77)	0.33 (0.26-0.44)	0.64 (0.43-0.96)	0.72 (0.65-0.80)	0.35 (0.26-0.46)
North	2.26 (1.83-2.81)	1.87 (1.62-2.14)	1.85 (1.36-2.50)	0.86 (0.47-1.56)	1.62 (1.42-1.86)	1.10 (0.80-1.50)
Smoking at Home	1.31 (1.16-1.48)	1.18 (1.08-1.29)	1.18 (1.00-1.40)	0.86 (0.61-1.19)	1.19 (1.09-1.30)	1.24 (1.02-1.50)
Personal Atopy	4.15 (2.83-6.08)	3.62 (2.57-5.11)	6.16 (4.00-9.49)	10.20 (5.54-18.80)	3.78 (2.69-5.33)	8.52 (5.62-12.92)
Family atopy	1.61 (1.29-2.02)	1.66 (1.39-1.97)	1.78 (1.32-2.40)	3.02 (1.87-4.88)	1.66 (1.40-1.98)	1.85 (1.35-2.53)
Socioeconomic Status						
High	0.87 (0.78-0.97)	0.96 (0.88-1.03)	0.94 (0.80-1.10)	0.67 (0.46-0.98)	0.99 (0.91-1.07)	0.85 (0.71-1.02)
Moderate	0.85 (0.76-0.94)	0.92 (0.85-0.99)	0.79 (0.68-0.92)	0.65 (0.46-0.92)	0.93 (0.86-1.01)	0.76 (0.64-0.90)

* The reference groups were female; habitation in rural or inland areas, or in the eastern region; absence of smoking at home; absence of personal or family atopy; and low socioeconomic status. Age was considered a numeric variable.

comparison of these figures with studies in other countries that used similar questions.

Bronchial asthma is a clinical diagnosis and does not have a universal definition[1]. Lacking a gold standard, it is rather difficult to determine the presence of bronchial asthma in epidemiological studies. Thus, surveys have usually inquired about respiratory symptoms, including wheezing, cough, etc., as well as about a previous diagnosis of asthma by a physician. Some studies have used objective markers of asthma such as bronchial hyperreactivity testing, exercise challenge, skin prick or RAST testing, monitorization of peak flow, inflammatory markers (eosinophilic cationic protein, etc.), or evaluation of previous medical records. European Community Respiratory Health Survey (ECRHS) in adults and International Study of Asthma and Allergies in Childhood (ISAAC) protocols have been developed in order to provide a standardized approach to respiratory symptoms and to allow for international comparison[1,2,22]. Further improvements are being implanted to the protocol are being implemented, including a video questionnaire to overcome cultural and translational differences[2]. Though the video questionnaire may provide more accurate evaluation of the prevalences of respiratory symptoms, the technical facilities and differences in cultural comprehension may hamper its use in some countries.

Though the questions in the present survey, about respiratory symptoms were derived from the ISAAC protocol, it is not quite identical with this protocol in its design and questionnaire format. The present study has incorporated ISAAC-based questions within a nationwide survey of chronic childhood diseases. However, the sampling method is different from the ISAAC protocol: the children included have a wider age range (0 to 17 years), and questions were not self-administered. The source of information was parents' responses (mostly mothers) to the questionnaire, and the survey was conducted via face-to-face interview by specially trained general practitioners. Besides evaluation of responses to standard questions on wheezing and physician-diagnosed asthma, new case definitions for lifetime and current (last 12 months) occurrences of wheezing and asthma have been employed. Despite these differences with the ISAAC protocol, we believe that a valuable set of epidemiological data on the prevalence of asthma-associated respiratory symptoms has been provided among children aged 0 to 17 by this survey. Epidemiological studies are difficult to conduct in Turkey, and collection of the data via face-to-face interview was considered necessary to achieve a better participation rate[23,24]. In this study, of the goal of 50,000 children in the study population, 46,813 children were surveyed (93.6 %).

The personal atopy and atopic heredity rates obtained from the present questionnaire were 0.4 percent and 2.2 percent, respectively, apparently lower than those reported in other countries and in previous studies (atopic heredity 12.7-20.5%) in urban areas of Turkey (Edirne, Bursa, Ankara)[8,10,11,14]. Recall bias and lack of adequate information among the responders on these disorders might have played a role in these low figures despite face-to-face interviews with the subjects. The 60-page questionnaire is quite long, despite filter questions, and the parents might not have provided responses with the same enthusiasm. Information obtained by further questions about allergic manifestations in the subject and also about first-degree relatives might have yielded more realistic responses about the atopy rates. The positive response rates for the presence of atopic heredity were not related to the socioeconomic status. Comparison of the responses among those with different socioeconomic levels suggested that the association between atopic heredity and various definitions of asthma used in the present study did not significantly change with socioeconomic level [ORs and (95% CIs) for lifetime wheezing and atopic heredity were 1.5 (1.2-1.9), 2.1 (1.6-2.9), and 1.9 (1.4-2.4), for high, moderate and low socioeconomic levels, respectively; chi-square for interaction: 3.28, $p=0.19$]. As one would expect comprehension of the questions to be better in higher socioeconomic levels, these findings suggested that comprehension by the subjects did not significantly affect the positive response rate for atopic heredity. This single question used to assess atopic heredity appears to have a low sensitivity. There may also be a bias produced by subjects from atopic families to answer more appropriately questions about atopic family history. However, the mis-classification is likely to be non-differential and thus would not lead to an overestimation of the association between atopic heredity and asthma.

Assessment of presence of ever (lifetime) wheezing or asthma by single questions also appears to result in lower prevalence rates than those determined by combined responses to other questions with these specific ones. As an example, the prevalence of lifetime wheezing obtained via combined responses was at least two times higher than that assessed by asking whether the child had ever wheezed (Table V). A similar situation was observed in the case of lifetime asthma. Besides translational challenges and cultural differences among people residing in different parts of the country, a previous diagnosis of "asthma" by a physician might have been interpreted alternatively by the parents. A recent study demonstrated that primary care physicians and pediatricians had a tendency to overlook the diagnosis of asthma in children and failed to prescribe appropriate therapy[25]. Parents would also deny this specific diagnosis and rather report bronchitis in their children. The significantly higher prevalence rate of bronchitis than that of asthma also supports this hypothesis (Table III). Thus, determination of "ever presence" of asthma through combined responses to questions seems more appropriate than assessment via inquiry of physician-diagnosis asthma. Since there is no exact equivalent of "wheezing" in Turkish, the question was translated as "whistling in the chest". As suggested in another study, even children in English-speaking countries may understand the term "wheezing" differently[2]. Further questioning about factors that provoke an asthma attack may yield a better assessment of the status of asthma in the past. In summary, we assume that combined responses to different questions on respiratory symptoms provide a more realistic picture for the occurrences of wheezing and bronchial asthma in Turkish children. This is also evidenced by the fact that the use of bronchodilator drugs was higher than the prevalence of physician diagnosed asthma among children (1.4 % vs 0.7 %, Table III).

There were notable differences in the prevalences reported from different urban parts of Turkey in previous studies. These differences also persisted between studies which used similar methodologies. The lifetime and current prevalences of asthma were reported as 2.8 to 17.4 percent and 5.6 to 9.8 percent respectively (Table I). Only one study (in Edirne) had evaluated childhood asthma and allergic disorders between populations in urban and rural areas, and reported no significant difference[11]. There is a great variation in the climate, geographical conditions, and cultural background between different regions of the country. Air pollution in urban areas, changing dietary habits, low rate of indoor contact with pet animals, and enlarging migration to metropolises might be partially responsible for the different prevalence rates reported in various studies. The house dust mite fauna is also variable in different regions, with the highest rate reported in samples from northern Turkey, and may play a role in promoting bronchial asthma[26]. A multicenter nationwide survey among adult asthmatics revealed that mite sensitivity with skin prick testing was almost two-fold higher in patients residing in coastal areas than in those residing inland [27]. A previous study has also revealed significant differences in dietary intake between preschool and primary school children as well as among those residing in different regions[28]. The consumption of poultry, fish, fresh vegetables and fruits increases with older age. Fish is consumed most frequently by those in the northern region, whereas fresh fruits and vegetables, fish and olive oil are consumed much less in eastern Turkey. The decline in the prevalence of asthma with increasing age might be affected by changes in dietary habits. However, it is unlikely that differences in dietary intake help to explain the prevalence differences between regions, and further studies to clarify this issue are required. In this study, the prevalence rate of physician-diagnosed asthma was almost twice as high among boys compared to girls, whereas the prevalence rate of wheezing was not different to the same extent (Table VI). This may indicate a sex bias in the referral of a wheezing boy rather than a girl to a physician (Yentl syndrome)[29].

Regarding the prevalence rates of lifetime wheezing and physician-diagnosed asthma in childhood in Turkey (5.4% and 0.7%, respectively, for children aged 13-14), the figures are considerably lower than those of neighboring countries such as Iran (10.9% for wheezing and 2.7% for asthma in children aged 13-14) and Greece (3.7% for wheezing and 4.5% for asthma in children aged 13-14), and also the mean figures of Europe and the world (16.7% and 13.8% for wheezing and 13.0 % and 11.3%

for asthma, respectively, among children aged 13-14)[3]. A recent study abroad confirmed the lower prevalence of asthma among children of Turkish immigrants aged 9-11 years than their German peers[30]. Though the rate of physician-diagnosed asthma in the past is very low in Turkey, the prevalence of asthma assessed by combined responses is close to the global figure of asthma prevalence (11.3 %) in the 13-14 years of age group.

In conclusion, the first nationwide ISAAC-based questionnaire survey conducted in 1996 used a physician-administered questionnaire applied to the parents of children aged 0 to 17. The study findings showed that respiratory symptoms associated with asthma were causing important morbidity in childhood. The diagnosis of asthma by physicians was made in a minority of the children having these respiratory symptoms. The prevalence of asthma symptoms were more frequent among boys, those residing in coastal areas and northern Turkey, and among those children exposed to cigarette smoke at home than in the corresponding comparison groups. The strongest associations were with personal atopy and atopic heredity. We believe that inquiry about wheezing and asthma is better accomplished with combined responses to different questions rather than with single ones, as recognition of asthma in childhood is not very good in the general population and even among the primary care physicians in Turkey.

Acknowledgements

This work was supported by an educational grant from Roche Pharmaceutical Inc., in conjunction with the 100th anniversary of its foundation. The authors wish to thank the parents and children who participated in the survey, the physicians involved in the collection of data, the HYB-MEDAR company that conducted the survey, and finally Roche Pharmaceutical Inc. for funding "The Chronic Childhood Diseases Questionnaire Survey (Ro-CODEC)".

Appendix Asthma Module of The Questionnaire for Chronic Diseases in Childhood

1. Have you ever observed / heard your children having wheezing or whistling in the past?
2. Have your children ever been diagnosed with asthma?
3. Has your child had a wheezing or asthma attack during the last 12 months?

If the answer is "Yes" to the above question, please indicate the number of attacks:

4. *In the last 12 months*, has your child ever awakened up with wheezing or cough?
5. *In the last 12 months*, has wheezing ever been severe enough to limit his/her speech to one or two words at a time between breaths?
6. *In the last 12 months*, has your child ever had wheezing during or after exercise (running or other sports, crying)?
7. *In the last 12 months*, has your child ever had cough without sputum at night, apart from a cough associated with a cold or chest infection?
8. *In the last 12 months*, has your child ever produced or phlegm mucus in the morning?
9. *In the last 12 months*, has your child ever woken up with chest tightness?
10. *In the last 12 months*, has your child ever experienced chest tightness and/or shortness of breath after contact with animals, feathers or dust?
11. *In the last 12 months*, has your child ever used any bronchodilator drugs?
12. Has your child had bronchitis at any time in the past?
13. Has your child had wheezing during bronchitis or a cold at any time in the past?
14. Has your child ever experienced recurrent or persistent cough for at least 12 months?

Filter Questions From Dermatological Section

15. Does your child have any allergic disease such as eczema, urticaria or atopic dermatitis?
16. Has your child ever experienced allergic rhinitis, bronchial asthma and/or eczema?
17. Has any other family member ever had allergic rhinitis, bronchial asthma and/or eczema?
18. How many family members smoke at home?

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