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Prevalence of Sensitization to Inhalant Allergens in Armenian Children

Baghdasaryan A. [1,2], Sarkissian A.[1,2], Leumann E. [3], Lauener R. [3,4,5]

1 "Arabkir" Joint Medical Centre – Institute of Child and Adolescent Health , Yerevan, Armenia
2 Chair of Pediatrics # 1, Yerevan State Medical University after M. Heratsi, Yerevan, Armenia
3 Zurich University Children's Hospital, Zurich, Switzerland
4 Children's Allergy and Asthma Hospital, Hochgebirgsklinik, Davos, Switzerland
5 Christine Kühne-Center for Allergy Research and Education, Hochgebirgsklinik, Davos, Switzerland

Abstract

It is important to have information about the prevalence of allergens and sensitizations present in the region the patient lives for optimal clinical care in allergy.

Currently, Global Allergy and Asthma European Network (GA2LEN) is conducting a European survey, Pan-European Standard Skin Prick Test study (PEP-study), assessing sensitization to the most common allergens in patients attending allergy outpatient clinics in different countries across Europe. Currently "Allergic Sensitization and Diseases in Armenian Children" study (ASDAC-study) is ongoing to assess the prevailing sensitizations to inhalant allergens in Armenia using the standardized panel and method applied in PEP-study. Current report provides information about sensitization pattern of 173 children from Armenia.

The study was aimed to reveal prevailing sensitizations to inhalant allergens in Armenian children presenting atopy and to implement a standardized method for diagnosis and care, which would allow to work with standards developed by GA2LEN for European Centers and to compare the obtained data with participant countries of PEP project.

A total of 173 children aged 2-18 years applied to "Arabkir" Joint Medical Centre – Institute of Child and Adolescent Health ("Arabkir" JMC - ICAH) with previous history or suspicion of atopy and were evaluated for sensitization to inhalant allergens using standardized prick test method, allergen solutions and the panel. Data were saved and analyzed in Microsoft Excel.

Among all investigated children 144 (83.2%) had sensitization to at least 1 allergen, of this 12.7% had monosensitization, 87.3% polysensitization up to maximum 11 allergens. Twenty-nine (16.8%) children had no sensitization. Overall, 6 allergens (Grass mix, dog dander, Dermatophagoides Pteronyssimus, Artemisia, Alternaria, Plane) allowed to identify more than 95% of sensitized subjects. Up to 10 allergens were needed to identify all sensitized children.

Six allergens allowed the identification of the majority of sensitized children. Nevertheless, for clinical care of individual patients, the whole spectrum of 18 allergens is needed to appropriately assess sensitization in Armenia.

Keywords: allergic sensitization, inhalant allergens, PEP- study, ASDAC study.

INTRODUCTION

It is important to have information about the prevalence of allergens and sensitizations present in the region the patient lives for optimal clinical care in allergy. The allergic reaction first requires sensitization to a specific allergen and occurs in genetically predisposed individuals. In case of allergen sensitization, the TH0 cells develop into TH2 cells; TH2 cells can then act on the B cells to promote class switching from immunoglobulin M production to antigen-specific IgE production [*Busse W. et al., 1995; Middleton E. et al., 1998; Paul W., 1999; von Bubnoff et al., 2001*]. Thus, sensitization is very important part in development of allergies and it is essential to have reliable information about current sensitization level to different allergens for each region. Skin prick testing is the standard for diagnosing IgE-mediated allergies [*Heinzerling L. et al., 2005; 2009; Burbach G. et al., 2009*].

A European survey is conducted assessing sensitization to the most common allergens in patients attending allergy outpatient clinics in different

Address for Correspondence:
"Arabkir" JMC – ICAH
30 Mamikonyants Street, Yerevan 0014, Armenia
Tel.: (+374 94) 52 19 86
E-mail: astghikbag@yahoo.com

Table 1.

Pan-European standard prick test panel adapted for Armenia (children > 2 years)

Histamine	Ambrosia
Negative control	Alternaria
Hazel	Cladosporium
Alder	Aspergillus
Birch	Parietaria
Plane	Cat
Cypress	Dog
Grass mix	Dermatophagoides pteronyssinus
Olive	Dermatophagoides farinae
Artemisia	Blatella

Note: *Poplar will be tested additionally for Armenia*.

countries across Europe. This study is called the Pan-European Standard Skin Prick Test study (PEP-study) and is realized in the frame of the European Network for Allergy and Asthma, Global Allergy and Asthma European Network (GA2LEN). This innovative tool was initiated in July 2005 for the surveillance of changes in epidemiology in GA2LEN 25 research centers.

The skin prick test panel, which assesses sensitization against 18 inhalant allergens, will for the first time provide standardized data on the frequency of many under-detected inhalant allergens in European patients suffering from allergic rhinitis and asthma. There would be advantages in harmonizing the standard panels of allergens used in different European countries, both for clinical purposes and for research, especially with increasing mobility within Europe and current trends in botany and agriculture. In addition to improving diagnostic accuracy, this would allow better comparison of research findings in European allergy centers [PEP, 2006].

Currently "Allergic Sensitization and Diseases in Armenian Children" (ASDAC) study is ongoing to assess the prevailing sensitizations to inhalant allergens in Armenia using the standardized panel and method as in PEP-study. Current report provides information about sensitization pattern of 173 children with atopy suspicion applied to Republican Allergy Centre placed in "Arabkir" Joint Medical Centre – Institute of Child and Adolescent Health ("Arabkir" JMC – ICAH).

The aim of the study was to reveal prevailing sensitizations to inhalant allergens in Armenian children presenting atopy and to implement a standardized method for diagnosis and care. This would allow to work with standards developed by GA2LEN for European Centres [*Heinzerling L. et al., 2010*] and later to compare the obtained data with findings of PEP project participant countries.

MATERIAL AND METHODS

The investigation was approved by American University of Armenia Institutional Bioethics Committee and conforms to the principles outlined in the Declaration of Helsinki (Br. Med. J. 1964; p.177).

Pediatric allergy specialist was trained at Zurich University Children's Hospital to learn the standardized method of skin-prick testing and to develop the tools to be used in ASDAC study.

Special Forms were designed, including: questionnaires for parents, family and personal history data, physical examination, environmental factors, prick-test results.

Intrahospital protocols were developed for physicians to choose the eligible patients for ASDAC study.

A total of 173 children aged 2-18 years applied to Republican Allergy Centre with previous history or suspicion of atopic disease (atopic dermatitis, allergic rhinitis, bronchial asthma) and were evaluated for sensitization to inhalant allergens using standardized prick test method, allergen solutions and the panel (Table 1).

Data were saved and analyzed in Microsoft Excel.

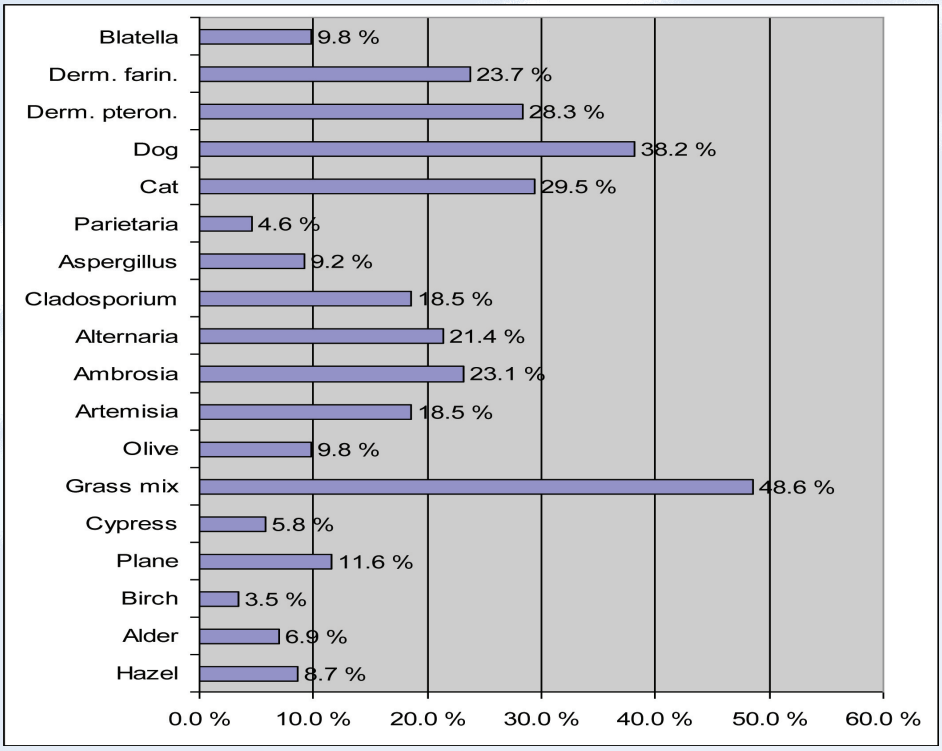

Figure. *Sensitization pattern to 18 inhalant allergens.*

Results

The sensitization pattern to 18 inhalant allergens was as presented in Figure.

Among 173 investigated children 144 (83.2%) had sensitization to at least 1 allergen. Of this 9 (12.7%) had mono-sensitization, in 135 (87.3%) children we revealed poly-sensitization up to maximum 11 allergens from 18 tested. Twenty-nine (16.8%) patients had no sensitization. Overall, 6 allergens (Grass mix, dog dander, Dermatophagoides Pteronyssinus, Artemisia, Alternaria, Plane) allowed to identify more than 95% of sensitized subjects. Up to 10 allergens were needed to identify all sensitized children.

P.-J. Bousquet and co-workers (2009) presented the prevalence of sensitization according to the country, allergens order from the most prevalent to the less under conditions for each country that participated in PEP-study. Data obtained from Armenia are added to the mentioned information and are presented in Tables 2 and 3 below.

Discussion

Based on the collaborative project of "Arabkir" JMC – ICAH and Zurich University Children's Hospital 173 children from Armenia presenting atopic disease were tested using a standardized skin prick test with a standardized spectrum of 18 allergens. Obtained data were compared with the data from 14 European countries. Six and 10 allergens out of 18 were needed to identify accordingly more than 95% and 100% of sensitized children in Armenia. In Europe, depending on the country, two (Switzerland) to nine (France) allergens out of 18 were sufficient to identify 95% of sensitized subjects; while four (Switzerland) to 13 (France, Portugal) allergens were required to identify 100% of sensitized subjects [*Bousquet P.-J. et al., 2009*].

The most prevalent allergen in Armenia was grass mix as in majority of European countries. The impact of Dermatophagoides farinae on sensitization pattern was lower than expected in Armenia, as well as in other countries. This was probably the consequence of the cross reactivity with Dermatophagoides pteronyssinus. The latter was more prevalent, and many patients were sensitized to both of them.

An unexpectedly important level of olive sensitization was revealed in Armenia, taking into account the fact that only several olive trees grow in restricted parts of the present area of Armenia. These results may be due to testing of subjects who have migrated from other countries or cross-sensitivity to other trees.

Table 2

Prevalence of sensitization according to the country, allergens order from the most prevalent to the less under condition for each country

Country	n	1	2	3	4	5	6	7	8	9	10	11	12	13
Armenia	173	84 (48.6%)	111 (64.2%)	126 (72.8%)	132 (76.3%)	135 (78%)	138 (79.8%)	140 (80.9%)	142 (82.1%)	143 (82.7%)	144 (83.2%)	-	-	-
Austria	202	56 (27.7%)	75 (37.1%)	87 (43.1%)	93 (46%)	97 (48%)	100 (49.5%)	103 (51%)	104 (51.5%)	105 (52%)	106 (52.5%)	107 (53%)	-	-
Belgium	200	59 (29.5%)	75 (37.5%)	86 (43%)	89 (44.5%)	91 (45.5%)	92 (46%)	93 (46.5%)	94 (47%)	95 (47.5%)	-	-	-	-
Denmark	178	122 (68.5%)	145 (81.5%)	160 (89.9%)	165 (92.7%)	167 (93.8%)	168 (94.4%)	169 (94.9%)	170 (95.5%)	171 (96.1%)	-	-	-	-
England	131	71 (54.2%)	93 (71%)	98 (74.8%)	99 (75.6%)	-	-	-	-	-	-	-	-	-
Finland	169	48 (28.4%)	63 (37.3%)	70 (41.4%)	75 (44.4%)	78 (46.2%)	79 (46.7%)	80 (47.3%)	81 (47.9%)	82 (48.5%)	-	-	-	-
France	200	70 (35%)	94 (47%)	102 (51%)	107 (53.5%)	110 (55%)	113 (56.5%)	116 (58%)	119 (59.5%)	121 (60.5%)	123 (61.5%)	124 (62%)	125 (62.5%)	126 (63%)
Germany	393	125 (31.8%)	178 (45.3%)	203 (51.7%)	211 (53.7%)	219 (55.7%)	227 (57.8%)	232 (59%)	234 (59.5%)	235 (59.8%)	235 (59.8%)	-	-	-
Greece	217	107 (49.3%)	142 (65.4%)	157 (72.4%)	165 (76%)	170 (78.3%)	173 (79.7%)	175 (80.6%)	176 (81.1%)	177 (81.6%)	178 (82%)	179 (82.5%)	-	-
Hungary	259	137 (52.9%)	160 (61.8%)	166 (64.1%)	175 (67.6%)	178 (68.7%)	181 (69.9%)	183 (70.7%)	184 (71%)	185 (71.4%)	186 (71.8%)	187 (72.2%)	-	-
Italy	230	86 (37.4%)	126 (54.8%)	133 (57.8%)	138 (60%)	141 (61.3%)	143 (62.2%)	144 (62.6%)	145 (63%)	146 (63.5%)	147 (63.9)	-	-	-
Poland	199	83 (41.7%)	108 (54.3%)	122 (61.3%)	131 (65.8%)	136 (68.3%)	138 (69.3%)	140 (70.4%)	141 (70.9%)	142 (71.4%)	-	-	-	-
Portugal	169	113 (66.9%)	136 (80.5%)	148 (87.6%)	153 (90.5%)	157 (92.9%)	159 (94.1%)	161 (95.3%)	162 (96.4%)	163 (96.4%)	164 (97%)	165 (97.6%)	166 (98.2%)	167 (98.8%)
Switzerland	116	93 (80.2%)	100 (86.2%)	103 (88.8%)	104 (89.7%)	-	-	-	-	-	-	-	-	-
The Netherlands	265	92 (34.7%)	122 (46%)	131 (49.4%)	137 (51.7%)	142 (53.6%)	145 (54.7%)	148 (55.8%)	150 (56.6%)	151 (57%)	-	-	-	-

Notes: 1: Grass, 2: Dermatophagoides pteronyssinus, 3: Birch pollen, 4: Cat dander, 5: Artemisia, 6: Olive pollen, 7: Blatella, 8: Alternaria, 9: Dog dander, 10: Parietaria, 11: Ambroisia, 12: Dermatophagoides farinae, 13: Cypress pollen, 14: Aspergillus, 15: Alder, 16: Plane pollen, 17: Cladosporium, 18: Hazel.
Results are expressed in frequencies and percents. Cells in gray: more than 95% of sensitized subjects are identified. Empty cells: Additional allergen did not change the prevalence.

Table 3

Allergens tested are reported in the table thereafter

Country	1	2	3	4	5	6	7	8	9	10	11	12	13
Armenia	gra	dog	derp	alt	art/pla	art/pla	derf/haz	derf/haz	cla/oli	cla/oli	-	-	-
Austria	gra	derp	bir	cat	art	dog	oli	cyp/pla	bla	alt	derf	-	-
Belgium	derp	gra	bir	dog	cyp	bla	art	derf	asp	-	-	-	-
Denmark	gra	derp	bir	art	dog/cat	dog/cat	derf	pla	bla	-	-	-	-
England	gra	derp	cat	bir/ald/pla	-	-	-	-	-	-	-	-	-
Finland	dog	bir	bla	derp	cat	asp/cla	gra	alt	art				
France	derp	gra	oli	cat	bla	cyp	dog	ald	asp/art	asp/art	alt	derf	amb
Germany	bir	derp	gra	cat	bla	alt	art	dog	asp	ald/pla	cla	-	-
Greece	gra	derp	oli	alt	par	cat/dog	amb	asp	bla	art	derf	ald	-
Hungary	amb	cat	gra	derp	art	alt	oli	cyp	cla	dog	derf	-	-
Italy	derp	par	oli	cat	gra	dog	bir/ald/haz	art/amb	cyp	pla	-	-	-
Poland	gra	derp	bir	dog	cat	alt	art	cyp	asp	-	-	-	-
Portugal	derp	gra	par	dog	derf	bir	bla	art	asp	cat	ald	haz	alt
Switzerland	gra	cat	derf	bir/ald/haz	-	-	-	-	-	-	-	-	-
The Netherlands	gra	derp	bir	oli	bla	amb	cat	derf	asp/par	-	-	-	-

Notes:

1: Grass, 2: Dermatophagoides pteronyssinus, 3: Birch pollen, 4: Cat dander, 5: Notes: Artemisia, 6: Olive pollen, 7: Blatella, 8: Alternaria, 9: Dog dander, 10: Parietaria, 11: Ambroisia,12: Dermatophagoides farinae, 13: Cypress pollen, 14: Aspergillus, 15: Alder, 16: Plane pollen, 17: Cladosporium, 18: Hazel.

ald: Alder, alt: Alternaria, amb: Ambroisia, art: Artemisia, asp: Aspergillus, bir: Birch pollen, bla: Blatella, cat: Cat dander, cla: Cladosporium, cyp: Cypress pollen, derf: Dermatofagoides farinae, derp: Dermatophagoides pteronyssinus, dog: Dog dander, gra: Grass pollen, haz: Hazel, oli: Olive pollen, par: Parietaria, pla: Plane pollen.

Cumulative frequency and percent are reported.

Cells with more than one allergen: the impact of all these allergens is similar. Each of them can substitute the others.

In conclusion, a limited number of allergens (6 allergens) allowed identification of the majority of sensitized subjects. However, 6 allergenns are not sufficient to provide comprehensive diagnostic information for individual patients. Thus, for clinical practice, the whole battery of 18 allergens is needed to appropriately assess allergens affecting at least 1–2% of patients [*Bousquet P.-J. et al., 2009*]..

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