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The effects of birth parameters on skin prick test results in adult patients.

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Abstract

Aim: To explore whether gender, low birth weight, prematurity and birth type (vaginal *vs.* abdominal) affects skin prick test results.

Methods: This cross-sectional study comprised 350 patients who applied with allergic respiratory symptoms and underwent skin prick test in-between February 2016-June 2016. The patients were asked for premature birth, low birth weight and birth type (vaginal *vs.* abdominal). The patients who could answer those questions (252 patients; 130 male, 122 female) were involved. The skin prick test results of the patients were evaluated regarding gender, premature birth, birth weight and birth type. The ratios of positive skin prick test in patients with a low/normal birth weight, abdominal *vs.* vaginal birth and premature *vs.* term birth were compared.

Results: Out of 252 patients who underwent skin prick test, 112 patients (44.5%) had a positive result. The most common allergens were grass pollen, cereal allergen mixture and *D. Farinea*. Most of the patients with positive test results (67.9%) were born with abdominal delivery had prematurity (65.0%) and low birth weight (73.9%). The odds ratios were 7.89, 2.50 and 3.97 respectively.

Discussion: The prematurity, low birth weight and abdominal birth seem to increase sensitivity to allergens.

Keywords: Skin prick test, Allergen, Abdominal delivery, Prematurity, Low birth weight.

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Introduction

The incidence of allergic diseases is increasing throughout the world [1]. Regional differences in the incidence of allergies are related to the differences in geological factors such as climate, flora, humidity, and altitude [2,3]. The detection and avoidance of the allergen are the first-line treatments for allergic diseases [4]. Allergy skin tests are the most valuable diagnostic tools because of their reliability, ease of application and low cost [5]. Skin prick test is a safe method, despite some systemic reactions, no death was reported [6].

It has been suggested that the first few months of life constitute a sensitive period during which exposure to certain allergens may predispose an individual to the development of atopic disease [7,8]. High quantity of the allergen was also reported to be important in the development of allergic diseases [9]. As many allergies show a seasonal variation, a relationship between the month of birth and the subsequent development of atopic disease might than be expected [10]. Abdominal deliveries and premature births were reported to increase the prevalence of asthma and allergy [11]. However, there are contradictory findings about abdominal delivery being a risk factor for positive skin prick test [12,13]. Studies in adults reported that abdominal delivery is a risk factor for asthma but poses no risk of atopy [14]. Skin prick test positivity was found to be higher in children with premature birth and low birth weight [15]. On the contrary, it was found to be lower in adults with premature birth and low birth weight [16].

In the light of previous studies, the effects of premature birth, low birth weight, and abdominal delivery on skin prick test still waits to be explored. In this study, our aim was to assess skin prick test results in adult patients with respect to some birth parameters including birth type (abdominal *vs.* vaginal), birth weight and premature birth.

Methods

Patients

This study was performed in Sirnak State Hospital, Turkey. The patients who applied with allergic respiratory complaints and were considered to have asthma and allergic rhinitis in-between February 2011-June 2011 were included. Medical histories of 350 patients related to some birth parameters were evaluated. Patients who could give information about their birth parameters including prematurity, birth weight, and delivery type (abdominal *vs.* vaginal) were included. The study protocol was approved by the Institutional Ethics Board (Sakarya University Ethics Board, November 22, 2016-190).

Skin prick test

Skin prick test was performed on 252 of 350 patients using the epicutan method. The evaluation was done 20 min after application of the allergens. Histamine hydrochloride and isotonic serum were used for positive and negative control, respectively. Positive control>3 mm and negative control<3 mm were accepted as validity criteria of the test. Induration diameter equal to or above 3 mm was accepted as a positive skin reaction to the allergen [17]. Skin prick testing was delayed in cases of active infection, active allergic skin disease, drug use (antihistaminic, corticosteroid, anti-inflammatory, immunosuppressive drugs) and pregnancy.

Twenty-eight common allergen extracts and negative and positive control extracts were used. House dust mites (*D. Farinea*, *D. Pteronyssinus*), grass pollen mixture (Cynodon dactylon, Festuca, Lolium perenne, Phleum pratense, Poa annua), tree pollen mixture (Betula pendula, Populus, Corylus colurna, Quercus, Ulmus, Fraxinus, Alnus, Salix, Fagus, Acer, Juniperus, Sambucus, Pinus), wild grass pollen mixture (Artemisia absinthium, Chenopodium, Parietaria judaica) Cockroach, Aspergillus Fumigatus and grain allergen mixture (oat, barley, wheat, rye) were used as allergy extracts.

Data collected and statistical analysis

Participants were asked about their method of delivery (abdominal *vs.* vaginal), whether they were born prematurely and information on their birth weight. Those born in less than 37 weeks were accepted as premature birth and those who were born in normal labor period but were less than 2500 grams were accepted as low birth weight.

SPSS 15.0 Windows package software was used for statistical analysis. Chi-square test was used for analysis of variables between genders. The odds ratio was used for risk assessment. P<0.05 was used as the statistically significant difference.

Results

Regarding 252 patients who could answer all questions, 130 (51.6 (%) were male, and 122 (48.4%) were female. Mean ages (mean ± SD) for female and male patients were 36.2 ± 11.9 and 32.1 ± 12.7, respectively (p=0.253).

Skin prick test was positive in 112 patients (44.5%). Table 1 shows allergen distribution for positive results. The most frequent allergens were grass pollen, cereal allergen mixture and *D. Farinea*.

Table 1. *The frequency of allergen types detected in skin prick test.*

Allergen type	Male		Female		Total		p
	n	%	n	%	n	%	
Grass	32	0.246	14	0.114	46	0.183	<0.001
Cereal	20	0.154	9	0.074	29	0.115	0.047
D.Farinea	11	0.085	6	0.049	17	0.067	0.256
D.Pteronyssinus	6	0.046	5	0.041	11	0.044	0.846
Crab grass	5	0.038	4	0.033	9	0.036	0.830
Total	74	0.569	38	0.311	112	0.445	<0.001

Table 2 shows skin prick test results in male and female patients according to birth type. Patients with a vaginal birth frequently had negative results. In contrast, patients with an abdominal birth frequently had positive results. The differences were statistically significant for both male and female patients.

Table 2. *Prick test results according to birth type in male and female patients.*

	Prick test result	Prick test result				p	Odds ratio
		Positive		Negative			
		n	%	n	%		
Male	Vaginal birth	30	0.405	44	0.595	<0.001	5.38
	Abdominal birth	44	0.786	12	0.214		
Female	Vaginal birth	10	0.139	62	0.861	<0.001	7.89
	Abdominal birth	28	0.56	22	0.44		
Total	Vaginal birth	40	0.274	106	0.826	<0.001	5.61
	Abdominal birth	72	0.679	34	0.321		

Table 3 shows skin prick test results in male and female patients according to prematurity and term birth. In general, 65.0% of patients with premature birth had positive prick test results. In contrast, 57.3% of patients with term birth had negative results.

Table 3. *The comparison of prick test results between patients with and without premature birth.*

	Prick test result	Prick test result				p	Odds ratio
		Positive		Negative			
		n	%	n	%		
Male	Premature birth	10	0.714	4	0.286	0.249	2.03
	Term birth	64	0.552	52	0.448		
Female	Premature birth	3	0.5	3	0.5	0.309	2.31
	Term birth	35	30.2%	81	0.698		
Total	Premature birth	13	0.65	7	0.35	0.054	2.5
	Term birth	99	0.427	133	0.573		

Table 4 shows skin prick test results in male and female patients according to birth weight. Including all patients, most of the patients (73.9%) with a low birth weight had positive skin prick test results. In contrast, most of the patients with

normal birth weight (58.3%) had negative results. The odds ratio was 3.97.

Table 4. Skin prick test results in male and female patients according to birth weight.

	Prick test result	Prick test result				p	Odds ratio
		Positive	%	Negative	%		
Male	Low birth weight	13	0.812	3	0.188	0.040	3.7
	Normal birth weight	61	0.54	52	0.46		
Female	Low birth weight	4	0.571	3	0.429	0.127	3.18
	Normal birth weight	34	0.295	81	0.705		
Total	Low birth weight	17	0.739	6	0.261	<0.001	3.97
	Normal birth weight	95	0.417	133	0.583		

Discussion

In people with genetic susceptibility, there is a tendency to develop allergic asthma, allergic rhinoconjunctivitis and atopic dermatitis by forming type I hypersensitivity against specific antigen [18]. Atopy prevalence was reported to be around 20% in the industrialized countries, and it is more common in females than males [19]. The relation of allergy to lifestyle, diet and hygienic ambient conditions were shown in epidemiologic studies. Determination of the allergen in atopic people is critical regarding treatment and protection [20].

In many studies conducted in Turkey, different rates (29%-57%) of allergic reactions were reported in patients with atopic complaints [21-24]. In our study, we obtained a positive response to at least one allergen in 44.4% of the patients who applied with allergic complaints. The probable reason for variability in ratios may be related to the variation of allergens in the area of residence or intensity of allergies of the patients consulting to physicians. In our study, the most frequent allergen sensitivity was determined as grass pollens.

The exact relation between abdominal delivery, low birth weight, premature birth and atopy in adults is still not understood [25,26]. In our study, we investigated whether abdominal delivery, low birth weight, and premature birth are risk factors for a positive skin prick test. In Turkey, there are a few similar studies, and the results of those studies do not support each other. In our study, we found that abdominal delivery, premature birth, and low birth weight in patients who applied with allergies increase positivity rates in skin prick tests. We determined allergy positivity as 26.8% in those with vaginal delivery and 67.5% in those with abdominal delivery. This is a very significant finding. We determined allergen positivity in premature births and breech births as 76.5% and 41.7%, respectively. Allergen positivity was 72.7% in those with low birth weight and 41.3% in those with normal birth weight. These data emphasizes the importance of birth parameters in allergic diseases.

In a study conducted in Cyprus by Kolokotroni et al., they found out that atopy and asthma risks were higher in children with abdominal deliveries, and allergies were more frequently determined [27]. In a study conducted by Polster et al., it was revealed that children with abdominal delivery have higher allergy frequencies and increased tendency for allergies [28]. Our study also supports these results. Wjst et al. found that date of birth appears to influence the risk of developing an allergic sensitization and allergic diseases [10]. Similar results were found by Karachaliou et al. [29]. However, Schafer et al. reported that month of birth is not correlated to allergic sensitization or to manifest allergic disease [30].

Conclusion

According to the results of prick tests performed in Sirnak province of Turkey, it was found that people born with abdominal delivery, premature births, and low birth weights had higher skin prick test positivity. Our study is also important in terms of bringing a new perspective to studies which can be conducted by skin prick test.

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