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Prevalence of Allergic Rhinitis Symptoms and Positive Skin Prick Test Results in Children with Recurrent Epistaxis

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Authors' contributions

This work was carried out in collaboration between both authors. Author AY performed the manuscript design. Authors AY and SA performed the drafting of the article. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Allergic Rhinitis is type 1 hypersensitive reaction of nasal mucosa and its primary mediator is IgE. Allergic rhinitis is mostly observed on children and adolescents. To investigate the prevalence of allergic rhinitis symptoms and positive skin prick test results in children with recurrent epistaxis.
Methods: The study included 57 pediatric patients with recurrent epistaxis and a control group of 49 healthy children. Their allergic symptoms and skin test results were assessed and compared with the control group.
Results: Forty-six of the 57 pediatric patients with recurrent epistaxis tested positive for at least one allergen. Nineteen of the 49 healthy children tested positive for at least one allergen. Between two groups, nasal obstruction (p=0.027), discharge (p=0. 001), sneeze (p=0. 013), itching (p=0. 002) and post-nasal drainage (p=0.004) complaints were observed significantly higher in the group having recurrent epistaxis.

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Conclusion: Our findings suggest that allergic sensitivity may play an important role in epistaxis of children. Diagnostic and therapeutic approaches to epistaxis in this age group need to be planned accordingly, with allergic etiology.

Keywords: Epistaxis; bleeding; allergy; allergic reaction; skin test, children.

1. INTRODUCTION

Hemorrhages in the nasal cavity, caused by vascular pathologies arising from mucosal damage or by coagulation disorders, are called epistaxis or nose bleeds. Epistaxis is not a disease, it is a symptom. It is a highly common ear nose and throat emergency. Yet its exact prevalence is not known, and studies report a wide range of 7-60% cases in the population, with only 6% of those seeing a physician [1,2]. Epistaxis is more common in males, prevalence increases by age, and it is seen more often in dry and cold winter months [1].

Allergic rhinitis is currently affecting 10-25% of the world population, and its incidence is rising. Allergic rhinitis is primarily a type I hypersensitivity reaction of the nasal mucosa, triggered by various allergens (pollens, house mites, etc.). Eosinophils, basophils, and the IgE antibodies on mast cells play an important role in this reaction. Although clinical presentation is basic for diagnosis, skin tests are extensively used to disclose allergies and to determine the specific allergens, and such tests have become the golden standard for diagnosis. The skin prick test is a simple, easy to apply, cheap and reliable test with a low risk of systemic reactions, and has become the most widely used among all skin tests [3,4].

The aim of this study is to evaluate the relationship between skin prick test positivity and epistaxis in pediatric patients.

2. MATERIALS AND METHODS

This is a prospective study, approved by the local Clinical Research Ethics Committee. Written informed consents were obtained from of all patients and/or from their parents.

The study included 106 patients (f: 65 females, 61.3%; m: 41 males, 38.6%) who were brought to the Outpatient Clinic of the Ear Nose and Throat Department, during June-December 2013. The patients were assigned to 2 different groups: The epistaxis group and the control group. Fifty-seven patients aged 7-18 years, with epistaxis as their primary complaint and have positive allergy history, were assigned to the epistaxis group, regardless of their gender or social status. Skin prick tests were performed on all, after the necessary diagnostic and therapeutic procedures were completed. The control group consisted of 49 patients who were treated for anemia previously in the outpatient clinic of the Pediatrics Department, and have positive allergy history, and were found to be totally healthy. Those patients also had skin prick tests performed on them. The gender, age, severity and duration of the complaints of all patients were recorded. A careful inquiry about any therapeutic drug use and a detailed history of systemic diseases were conducted for both the patients and the healthy children.

2.1 Inclusion Criteria

1. Patients younger than age 18.
2. Patients who were brought to the outpatient clinic with epistaxis as their primary complaint;
3. Having positive allergy history.

2.2 Exclusion Criteria

1. Patients older than age 18.
2. Who did not agree to do a skin prick test?
3. Immune system disease potentially modifying blood cytokine levels;
4. Usage of steroids in the last one month and antihistamines in the last fifteen days;
5. Upper respiratory tract infection;
6. Acute airway disease like non-allergic eosinophilic rhinitis or drug-induced rhinitis;
7. Asthma;
8. Presence of unilateral isolated polyp.

2.3 Skin-prick Test

Standard allergen extracts of the brand Alyostal ST-IR (Stallergenes S.A, France) were used for skin prick tests. Allergen extracts were drawn into Quick test applicators with 8 heads, and were applied to the skin at the ventral side of the forearm, after the testing site was cleansed with alcohol. Topical Histamine hydrochloride was used as a positive skin test control, and isotonic

NaCl was used as a negative control. The results were read at the 15th minute after application. Test validity criteria were set as positive if the induration exceeded the negative control by 3 mm [5]. Fourteen common allergens plus a negative and a positive control were applied to the skin of the forearm with two 8-headed applicators.

2.4 Statistical Analysis

The NCSS (Number Cruncher Statistical System) 2007 & PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) program was employed for evaluating the data gathered in the study. Besides using descriptive statistics (mean, standard deviation) in evaluating the data, the One-Sample T Test and the Mann-Whitney Test were used for comparing the quantitative data, for comparing the normally distributed parameters in between groups. The significance level was set at $p<0.001$ and $p<0.05$.

3. RESULTS

The study included 106 children (f: 65, 61.3%; m: 41, 38.6%) who were treated in our clinic during June-December 2013. The children were assigned to 2 groups: Group 1 included 57 patients with recurrent epistaxis (f: 36, m: 21; mean age 11.8 yrs; range 7-18); Group 2 included 49 healthy controls (f: 29, m: 20; mean age 13.6 yrs; range 9-17). One-sample t-test results comparing the mean ages of the 2 groups did not reveal any statistically significant difference ($p>0.05$) (Table-1).

Forty-six (80.7%) of the 57 children in Group 1 tested positive for at least one allergen, while 11(19.3%) showed no positive skin reaction to any of the allergens. Among the 46 patients with positive skin reactions, 11(19.3%) tested positive for only one allergen, 13(22.8%) tested positive for 2 allergens, 13(22.8%) tested positive for 3 allergens, 7(12.2%) tested positive for 4, 1(1.8%) tested positive for 5, and 1(1.8%) tested positive for 6 allergens.

Nineteen (38.7%) of the 49 healthy children in Group 2 tested positive for at least one allergen, while 30(61.3%) showed no positive skin reaction to any of the allergens. Among the 19 children with positive skin reactions, 5(10.2%) tested positive for only one allergen, 6(12.2%) tested positive for 2, another 6(12.2%) tested positive for 3, 1(%2%) tested positive for 4, and 1(2%) tested positive for 5 allergens.

Allergic skin reactions to the house dust mite *D. pteronyssinus* were observed in 19(33.3%) patients of Group 1, and 6(12.2%) children in Group 2 tested positive for the same allergen. Comparison of the 2 groups with the Mann-Whitney test revealed that the test results of Group 1 were significantly higher than those of Group 2 ($p= 0.0076$). Allergic reactions to cockroach allergen were observed in 21(36.8%) patients of Group 1, and in 7 children (14.2%) of Group 2. The Mann-Whitney test showed that the results of Group 1 were significantly higher than those of Group 2($p= 0.0137$). The Trees Mix allergen, a mixture of various tree allergens, tested positive in 17(29.8%) patients of Group 1, and in 4(8.1%) children of Group 2. The Mann-Whitney test results revealed that the results of Group 1 were significantly higher than those of Group 2($p= 0.0095$) (Table-2).

In our cases, symptoms of patients with epistaxis and control group were listed as stuffiness, runny nose, sneeze, itching of the nose, and nasal discharge. Between two groups, nasal obstruction ($p= 0.027$), discharge ($p= 0. 001$), sneeze ($p= 0. 013$), itching ($p= 0. 002$) and post-nasal drainage ($p= 0.004$) complaints were observed significantly higher on the group having epistaxis group (Table 3).

4. DISCUSSION

Allergic rhinitis is an allergen specific sensitization seen in atopic individuals, and involves the production of IgE antibodies. At the first contact with the specific airborne allergen, B-lymphocytes and plasma cells secrete antibodies. On subsequent contacts, antigens binding to specific IgE antibodies on mast cells trigger the degranulation of mast cells. Once mast cells are degranulated, they release histamine, leukotrienes, cytokines, prostaglandins and platelet-activating factor (PFA). Histamine release causes sneezing, runny-itchy nose, an increase in capillary permeability, vasodilation, and hyper secretion. Thus chronic inflammation sets in, disturbing the mucosal integrity of the nasal septum, leading to erosion that starts the epistaxis attack [6].

It has been postulated that swelling of the nasal mucosa in Allergic rhinitis at the site of the sinus ostia may compromise ventilation and even obstruct the sinus ostia, leading to mucus

retention and infection [7]. Several mechanisms have been considered regarding the link between allergic inflammation of the nose and sinus disease, namely (i) direct deposition of the allergen on the sinus mucosa resulting in allergic inflammation, (ii) narrowing or obstruction of the sinus ostium secondary to allergic inflammation, (iii) exposure to the sinus mucosa of allergen by hematogenous spread, and (iv) reflex mediated by neurogenic reactions [7].

Epistaxis can be a significant symptom of allergic rhinitis. Up to 90-95% of all nosebleeds occur at the anterior region of the nose, the arterial and venous an astomoses on Little's area. Etiologic factors for epistaxis are grouped under 3 headings, as environmental, local and systemic factors. Cold and dry weather is an important environmental factor that increases the risk of nosebleeds. During seasonal weather changes, in winter and also in spring and summer when pollens appear, commonly there is an increase in epistaxis cases. Local trauma is the most common one among local etiologic factors. Nose picking or scratching, especially in children with allergic rhinitis, play an important role in epistaxis. Septum deviation, upper respiratory tract infections (URTI), chronic rhinosinusitis are also cited among local etiologic factors. Hypertension is a most common systemic factor in epistaxis, with various coagulation defects, especially hemophilia, and other systemic causes like aspirin use, chronic kidney disease and various other factors following [6].

Inflammation of the nasal mucosa is indicated as the leading cause for epistaxis in allergic rhinitis cases. Active inflammatory mediators, especially histamine, released in allergic reactions, give rise to inflammation, vasodilation and an increase in capillary permeability of the nasal mucosa. Those in turn may lead to erosion of the nasal septum mucosa and to epistaxis. Any local trauma of the sensitized mucosa, like nose picking, nose scratching or any other irritation may start the bleeding.

Allergic rhinitis may give rise to recurrent epistaxis attacks, especially in the pediatric age group. Inflammation of the nasal mucosa causes an increased blood flow to the area. Any trauma or irritation of the mucosa thus saturated with blood may trigger recurrent epistaxis episodes. Thus, allergic rhinitis is cited as one of the most important causes of recurrent epistaxis in children [8].

Table 1. Demographic of the groups

Variables	Epistaxis group	Control group	P
Sex			
Male	21	20	(>0.05)
Female	36	29	(>0.05)
Age (median)	11.8±3.77	13.6±2.43	(>0.05)

*One-sample T test *p<0,05 **p<0,01*

Table 2. Allergens variance of the groups

Allergens	Epistaxis group	Control group	P
D. farinae	13(22.8%)	6(12.2%)	0.1492
D. pteronyssinus	19(33.3 %)	6(12.2%)	0.0076*
Cockrach	21(36.8%)	7(14.2%)	0.0137*
Trees mix	17(29.8%)	4(8.1%)	0.0095*
Grasses mix	13(22.8%)	10(20.4%)	0.7986
Pine	5(8.7%)	1(2%)	0.1328
Cat feather	5(8.7%)	2(4%)	0.3239
Nuts	2(3.5%)	-	-
Penicillium mix	-	-	-
Cladosporium	1(1.7%)	2(4%)	0.4802
Cacao	5(8.7%)	3(6.1%)	0.5988
Egg	8(14%)	2(4%)	0.069
Wheat	5(8.7%)	-	-
Alterina	1(1.7%)	1(2%)	0.9144

*Mann-Withney test *p<0.05 **p<0.001*

Table 3. Allergic rhinitis symptoms of the epistaxis group and control group

Symptoms	Epistaxis group	Control group	P
Nasal obstruction	68.4%(39/57)	24.4%(12/49)	0.027
Nasal discharge	61.4%(35/57)	14.2%(7/49)	0.001**
Sneeze	70.1%(40/57)	16.3%(8/49)	0.013*
Itching of the nose	43.8%(25/57)	8.1%(4/49)	0.002*
Post-nasal drainage	22.8%(13/57)	4.0%(2/49)	0.004*

*Independent-Samples Test: *p<0.05 **p<0.001*

A study reported that recurrent epistaxis was seen in 20.2% of the children with nasal symptoms and skin test positivity [8]. In our study 46(80.7%) of the 57 pediatric patients with recurrent epistaxis had skin test positivity for at least one allergen, while only 19(38.7%) of the 49 healthy controls tested positive for at least one allergen. Allergic reactions, especially to *D. pteronyssinus* (p= 0.0076), to Cockroach (p= 0.0137) and to Trees mix (p= 0. 0095) allergens were significantly higher in the group with epistaxis. Our study is a first in medical literature for revealing the relationship between skin prick test positivity and epistaxis in pediatric patients.

Intranasal corticosteroid therapy is yet another important factor which may lead to epistaxis in allergic rhinitis cases. Nasal application causes local irritation at the start of the therapy. The risk increases with a history of nasal surgery, and with application errors (spraying directly to the septum). One research observed an epistaxis rate of 17-23% as a side effect of intranasal corticosteroid therapy [9]. Another research reported this rate as 5-10% [10]. Both studies point to the fact that epistaxis is a frequent and important side effect of intranasal corticosteroid therapy prescribed for allergic rhinitis. However, it can be overcome by readjusting the dosage [9-11]. Our study excluded all cases who were on medications, which might affect the skin test results.

Even though epistaxis may be an important side effect of intranasal steroid use, it is true that nosebleeds in untreated cases of allergic rhinitis subside with intranasal corticosteroid therapy. The reason for such an effect was shown to be due to the steroids' inhibiting action on allergic reactions. Thus, edema of the nasal mucosa and nasal mucosal erosion recedes by intranasal corticosteroid use, which in turn diminishes the frequency of epistaxis episodes.

Our study is a preliminary study with a small sample size, and should be considered as a proposal for further studies with larger series to confirm our findings. The children with epistaxis in our study group had a high percentage of skin prick test positivity that suggests a probable allergic etiology.

In our study we found a significant association between recurrent epistaxis and allergic rhinitis symptoms and positive skin prick test results. This association arises the question whether there is a common mechanism-playing role in the pathogenesis of both conditions. We believe that physicians dealing with epistaxis need to give a chance to nonsurgical treatment modalities, and consider anti-allergy medication and allergen avoidance among their treatment options.

5. CONCLUSION

Our results indicate that allergy may play an important role in the epistaxis episodes of children. Allergic rhinitis is an important disease entity due to its chronic nature and high prevalence, and has to be considered in the etiology and differential diagnosis of epistaxis cases, especially in the pediatric age group.

A careful history taking and a thorough physical examination may easily reveal the presence of allergic rhinitis in an epistaxis case. This will help avoid various expensive and time-consuming diagnostic inquiries required for identifying the cause of the bleeding, and will facilitate the start of the relatively cheap treatment of allergic rhinitis without any delay.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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