

THE RELATIONSHIP BETWEEN HELICOBACTER PYLORI INFECTION AND ALLERGIC RHINITIS DURING CHILDHOOD

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ABSTRACT

Background: There are different publications on the relationship between the infections and development of allergic diseases.

Aims & Objective: To examine the relationship between Helicobacter pylori infection and allergic rhinitis during childhood.

Materials and Methods: 50 dyspeptic patients, 30 patients suffering from allergic rhinitis (overall 48 paediatric and 32 adolescent age groups) additional to 20 children from paediatrics polyclinics as control were included in this study. The serums of all of the patients were studied with respect to existence of specific IgE developed from house dust mites, cat's fur, rye grass and pine tree, using IgG.

Results: 33.3% (16/48) of the cases from paediatric group and 31.3% (10/32) of the cases from adolescent group were diagnosed with H pylori IgG positive. 10.4% (5/48) of the cases from paediatric group and 31.3% (10/32) of the cases from adolescent group were diagnosed with allergic rhinitis. Contrary to the paediatric group, the number of the cases diagnosed with allergic rhinitis IgG was significantly more while the number of the cases diagnosed with H pylori IgG positive was less in the adolescent group ($p=0.84$ and $p=0.019$). Furthermore, the level of specific IgE developed from rye grass (18.8% vs 4.2%) was determined to be significantly higher in the adolescent group than the paediatric group ($p=0.033$).

Conclusion: Contrary to the paediatric group, the number of cases diagnosed with allergic rhinitis is higher while the number of cases diagnosed with H pylori infection is less in adolescents.

Key Words: Helicobacter Pylori; Allergic Rhinitis; Children

Introduction

The number of patients suffering from allergic diseases including allergic rhinitis has increased in developed countries in recent years.^[1] "Hygiene Hypothesis" was suggested by Strachan to explain the escalation in the number of allergic diseases such as asthma, allergic rhinitis and atopic dermatitis compared to the reduction in Helicobacter pylori (H. pylori) prevalence.^[2] According to this hypothesis, rich antigenic environment is necessary for immune maturation. Infections experienced during early childhood result in immune maturation while reducing atopic sensitization. Particularly, the infections involving the gastrointestinal system accommodate maturation of the mucosal immunity by affecting the lymphoid tissue.^[3]

Although some publications indicate that there is no relationship between infections and development of allergic diseases exit^[4], there also exist publications which indicate that H pylori infection reduce the rate of asthma^[5] and food allergy^[6] in children. However, the

number of publications relevant to the relationship between rise in H pylori infection and fall in allergic rhinitis is limited.^[7] In this study, our goal is to find out whether there is a relationship between H pylori infection and allergic rhinitis and specific IgE levels in children.

Materials and Methods

The study was conducted between September 2011 and September 2012 following obtaining the approval of the Ethics Committee of Abant İzzet Baysal University. The study involved 50 patients experiencing dyspeptic symptoms such as upper abdominal pain, heartburn, indigestion and bloating and 30 patients with symptoms such as nasal congestion, nasal discharge and sneezing, who were diagnosed with allergic rhinitis according to ARIA (Allergic Rhinitis and its Impact on Asthma)^[8] criteria. Also 20 children, who were admitted to paediatrics polyclinics for upper respiratory tract infections, dermatitis and anemia control, were chosen to establish our control group.

All of the serums obtained from these children were stored at -20°C. Micro-ELISA method (Vircell S.L. Granada, Spain) was used for assay of the Anti-IgG *Helicobacter pylori* antibodies of these serums. Specific IgE, which is observed frequently and developed as a reaction to house dust mites (d1, d2), cat's fur (e1), rye grass (g5) and pine tree (t16), was studied using fluoroenzyme immunoassay (UniCAP 100, Phadia AB, Uppsala, Sweden) method.

The data was evaluated with Package for the Social Sciences (SPSS, Inc., Chicago, IL), version 15.0 for Windows statistics program. The results were provided in the form of an average (standard deviation). Student-t, chi-squared (χ^2) and Mann-Whitney U tests were used for statistical evaluation and $p < 0.05$ was accepted as significant.

Results

When the fundamental variables of the groups were compared with the control group, no significant difference was observed ($p > 0.05$). The age of the cases involved in the study varied between 3 and 17 and their average age was 10.2 (3.1). 32 (40%) of the cases were male and 48 (60%) of them were female. *H pylori* IgG positive was detected in serums of 26 (32.5%) cases from the patient group and 7 cases (35%) of the cases from control group. No significant difference was observed in the statistical evaluation between the two groups ($p = 0.77$). Table 1 was provided to compare the dyspeptic and allergic rhinitis patients with the control group.

Comparison of the groups with *H pylori* IgG positive and *H pylori* IgG negative is provided in table 2. In the group with *H pylori* IgG negative allergic rhinitis was observed in 10 cases (18.5%) while being observed in 5 cases (19.2%) in the group with *H pylori* IgG positive. No significant difference was observed in the statistical evaluation between the two groups ($p = 0.93$).

In the *H pylori* IgG positive group, the serums tested positive for d1 in 1 case (3.8%), d2 in 2 cases (7.7%) and g5 in 3 cases (11.5%). Analysis of the serums of the *H pylori* IgG negative group showed that 6 cases (11.1%) had tested positive for d1, 6 cases (11.1%) for d2, 2 cases (3.7%) for e1, 5 cases (9.3%) for g5 and 4 cases (7.4%) for t16. However, in the statistical evaluation regarding specific IgE rates, no significant difference was observed between the two groups ($p > 0.05$).

Table-1: Comparison of the dyspeptics, allergic rhinitis and control groups

P	Dyspeptics n=50	Control n=20	Variables	Control n=20	AR n=30	P
0.93	32.5	35	<i>H pylori</i> IgG positive ¹	35	30	0.71
0.93	36	35	Gender (Male) ¹	35	46.6	0.41
0.15	10.7 (2.8)	9.7 (2.5)	Age (years) ²	9.7 (2.5)	9.5 (3.5)	0.99
0.14	13 (0.9)	13.4 (0.8)	Hemoglobin (g/dl) ²	13.4 (0.8)	13 (0.9)	0.13
0.38	8	15	d1 ¹	15	10	0.59
0.55	10	15	d2 ¹	15	10	0.59
0.85	4	5	e1 ¹	5	0	0.22
0.5	10	5	g5 ¹	5	10	0.52
0.36	4	0	t16 ¹	0	6.6	0.24

AR: Allergic rhinitis; ¹ %, ² Mean (SD); d1, d2: house dust mites IgE; e1: cat's fur IgE; g5: rye grass IgE; t16: pine tree IgE

Table-2: Comparison of the *H pylori* positive and *H pylori* negative groups

Variables	<i>H pylori</i> Positive (n=26)	<i>H pylori</i> Negative (n=54)	OR	95% CI	p
Dyspeptics ¹	65.3	61.1	1.2	0.45-3.18	0.71
Allergic rhinitis ¹	19.2	18.5	0.93	0.31-3.45	0.93
Gender (Male) ¹	38.5	40.7	0.9	0.34-2.37	0.84
d1 ¹	3.8	11.1	0.32	0.03-2.8	0.28
d2 ¹	7.7	11.1	0.66	0.12-3.55	0.63
e1 ¹	0	3.7	-	-	0.32
g5 ¹	11.5	9.3	1.27	0.28-5.81	0.75
t16 ¹	0	7.4	-	-	0.15

¹ %, d1, d2: house dust mites IgE; e1: cat's fur IgE; g5: rye grass IgE; t16: pine tree IgE

Table-3: Comparison of the characteristic features of the paediatric and adolescent groups

Variables	Paediatric N=48	Adolescent N=32	OR	95% CI	p
<i>H pylori</i> IgG positive ¹	33.3	31.3	1.1	0.42-2.86	0.84
Allergic rhinitis ¹	10.4	31.3	0.25	0.07-0.84	0.019*
Gender (Male) ¹	43.8	34.4	1.48	0.58-3.74	0.4
d1 ¹	4.2	15.6	0.23	0.04-1.29	0.076
d2 ¹	6.3	15.6	0.36	0.08-1.62	0.17
e1 ¹	0	6.3	-	-	0.078
g5 ¹	4.2	18.8	0.18	0.03-1	0.033*
t16 ¹	2.1	9.4	0.2	0.02-2.07	0.14

* $p < 0.05$ is statistically significant; ¹ %, d1, d2: house dust mites IgE; e1: cat's fur IgE; g5: rye grass IgE; t16: pine tree IgE

32 cases (40%) belonged to the adolescent age group while 48 (60%) cases belonged to the paediatric group. *H pylori* IgG positive was observed in the serums of 16 cases (33.3%) from the paediatric group and 10 cases (31.3%) from the adolescent group. No significant difference was observed between the two groups when they were statistically evaluated ($p = 0.84\%$). The number of cases with allergic rhinitis was 5 (10.4%) in the paediatric group while it was 10 (31.3%) in the adolescent group. Statistical evaluation of the groups with allergic rhinitis showed significant difference between the two groups ($p = 0.019$).

In the paediatric group, serum analysis tested specific IgE positive for d1 in 2 cases (4.2%), d2 in 3 cases (6.3%), g5 in 5 cases (15.6%) and t16 in 1 case (2.1%). In the adolescent group, serum analysis tested specific IgE positive for d1 in 5 cases (15.6%), d2 in 5 cases (15.6%),

e1 in 2 cases (6.3%), g5 in 6 cases (18.8%) and t16 in 3 cases (9.4%). From statistical point of view, the serum specific IgE level for g5 was determined to be significantly higher in the adolescent group than the pediatric group ($p=0.033$). No significant difference was observed in the other statistical evaluations ($p > 0.05$) (Table 3).

Discussion

H. pylori prevalence is associated with low social economic status, living in crowded societies, low hygiene level^[9,10], social status, age^[11], region, ethnic group^[9,12], nutrition status^[13] and blood group^[9,14]. The studies conducted in our country indicate that the *H. pylori* infections vary between 53%^[15] and 66%^[16]. The *H. pylori* sero-positivity of 32.5% obtained in our study was determined to be pretty low when it was compared to the other data published in our country.

Serum *H. pylori* IgG positive was detected in 34% of our dyspeptic cases. *H. pylori* infection is accepted as an important factor in development of non-ulcer dyspepsia. Despite this, publications indicating that there is no relationship between *H. pylori* and dyspeptic complaints in children are also available.^[17] The *H. pylori* sero-positivity was higher in the dyspeptic patient group than the allergic rhinitis group, but this change was not statistically significant (30% vs. 34%, $p = 0.71$).

Individuals begin their involvement in social life as they step into adolescence so they face *H. pylori* infections more frequently. 10% of the children are diagnosed with *H. pylori* infection in the developed countries while this number increases by 0.3% to 1% every year.^[13] *H. pylori* infection is observed more frequently and at young age in developing countries.^[18] *H. pylori* sero-positivity was determined to be 33.3% in our study.

Along with urea breath test and stool antigen test used to diagnose the *H. pylori* infections, serological tests are also used to determine the antibodies existing in the blood. In general, accuracy of the serological test conducted using the blood serum is between 60% and 70% in children.^[19,20] Additionally, there are publications which indicate that ELISA test may not provide accurate results due to immature response with respect to *H. pylori* in childhood and therefore, it is not reliable.^[19,21]

According to hygiene hypothesis, *H. pylori* infection provides protective effect against allergic rhinitis.^[2] In a study involving adults, it was observed that as people

age, the *H. pylori* prevalence increases and the rate of observing allergic rhinitis reduces, but this change is not only associated with the rising *H. pylori* infection but also the change in the social environment.^[22] The infections experienced during early years of one's life increase the risk of allergic rhinitis in the same way.^[23]

This rise does not depend only on the microbial factors but also depends on the antibiotics used against these factors.^[24,25] In particular, rise in the number of antibiotics used in the western countries coincide with the rise in frequency of the allergic diseases and this coincidence may be presented as an evidence of the former indications.^[4] We obtained a similar result in our study as well. Particularly, we detected a statistically insignificant reduction in *H. pylori* sero-prevalence in the adolescent group compared to the pediatric group in our study (33.3% vs. 31.3%, $p=0.84$).

On the other hand, we observed that the number of cases diagnosed with allergic rhinitis increase along with age (10.4% vs. 31.3%, $p=0.019$). Although antibiotics are used commonly, the number of *H. pylori* infections continues to rise because *H. pylori* eradication through monotherapies is between 10% and 50%.^[26] Nevertheless, there are also publications indicating that treatment of respiratory tract and gastrointestinal system infections during early childhood doesn't increase allergic diseases with advancement of age.^[27,28]

In recent years, the form of allergen specific responses has been revised. In particular, rise in Th₁ responses instead of Th₂ responses with respect to general allergens has been interpreted as a result of rise in the number of day cares, crowded families, high exposure to endotoxin and close contact with farm animals.^[29-31]

However, another study indicates that pet cats play a protective role against asthma. A clear decrease was detected in sensitization risk in conjunction with modified Th₂ response in children living in houses where the amount of Fel d1 protein found in the saliva of cats in house dust is $\geq 20 \mu\text{g/g}$. This response, which does not result in rise in asthma, is provided with intervention of IgG and IgG4 antibodies without IgE.^[32]

We detected a statistically significant rise in the serum specific IgE level for g5 depending on the increased duration of coming in contact with allergens during adolescence compared to the data related to the pediatric group. However, in the study conducted over adults, it was determined that although *H. pylori*

prevalence increased along with age, serum specific IgE rates decreased.^[23]

It was observed that the small number of patients, not taking into account the infections experienced and the medications taken by these patients and not conducting a research regarding the social environments of these patients were the most important limitations of our study.

Conclusion

The number of allergic rhinitis cases increase along with reduction in *H. pylori* infection. This result supports the hygiene hypothesis. Nevertheless, the specific IgE level for g5 rise depending on the duration of contact with allergens.

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