

***Lophomonas blattarum* Infection in Allergic Rhinitis Patients: Does it affect the Treatment of Allergic Rhinitis?**

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ABSTRACT

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Introduction:

This study aims to investigate the prevalence of *Lophomonas blattarum* in allergic rhinitis patients and the effect of allergic rhinitis treatment in patients with allergic rhinitis along with *L. blattarum* infection.

Materials and Methods:

This Prospective cohort study was conducted in the tertiary otorhinolaryngology-head and neck centers in Mashhad, Iran. Patients with allergic rhinitis (in the two groups of *L. blattarum*-positive and *L. blattarum*-negative) were treated for allergic rhinitis, and their response to treatment was evaluated after 2 and 4 weeks.

Results:

In this study, 56 patients (including 36 females and 20 males) were examined. The *L. blattarum* was identified in 16 patients (28.6%), 10 of whom were female. There was no significant relationship between *L. blattarum* infection with gender (p: 0.990), occupation (p: 0.915), type of allergy (p: 0.990), and various allergens. After treatment, the severity of allergic rhinitis symptoms, except for eye swelling (p: 0.203), were significantly decreased in *L. blattarum*-positive patients. Also, the severity of allergic rhinitis symptoms were remarkably decreased in both *L. blattarum*-positive and *L. blattarum*-negative patients.

Conclusion:

The *L. blattarum* infection was found in 28.6% of patients with allergic rhinitis, and *L. blattarum* infection did not affect the treatment of allergic rhinitis.

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Introduction

Allergic rhinitis is a prevalent upper airway disorder caused by hypersensitivity due to immunoglobulin E (IgE)-mediated inflammatory response to indoor and outdoor environmental allergens, characterized by nasal congestion, pruritus, rhinorrhea, and sneezing (1). The prevalence of allergic rhinitis varies based on genetic and environmental characteristics.

Epidemiological studies indicate an increase in the incidence of this disease in recent years (2). The prevalence of allergic rhinitis worldwide is 10% -40% in adults and 2% -25% in children (3,4).

Previous studies revealed that allergic rhinitis affects about 11.9% of adults and 21.2% of children in Iran (5,6). There is currently no definitive treatment for allergic rhinitis, which adversely affects work productivity, school performance, and social life, especially in severe cases. Moreover, the treatment of this disease imposes a high economic impact on the health care system of countries (7). Allergic rhinitis is triggered by inhaling environmental allergen particles such as pollens, dust mites, humidity, mold, and even parasitic infections or parasitic-derived molecules (8,9). *Lophomonas blattarum* is a protozoan parasite that inhabits arthropods' intestines, including mites, termites, and cockroaches (10). *L. blattarum* could affect several organs, but the respiratory tract is the most common site of infection. The symptoms (fever, dyspnea, sputum, and cough) are similar to those of other respiratory disorders like bronchitis, pneumonia, bronchial asthma, and allergic rhinitis (11). The *L. blattarum* is most commonly seen in patients with allergic rhinitis, asthma, and immune deficiency, including cancer, organ transplantation, and corticosteroid therapy (12,13). Since the prevalence of *L. blattarum* is high in allergic rhinitis cases and their symptoms are similar, the presence of *L. blattarum* may exacerbate this allergy symptom. Therefore, this study was conducted to investigate the prevalence of *L. blattarum* infection in allergic rhinitis patients and evaluate the effect of allergy treatment in patients with allergic rhinitis along with *L. blattarum* infection.

Materials and Methods

Study design and population

This prospective cohort study was conducted on patients with the diagnosis of allergic rhinitis that admitted to the Ear, Nose, and Throat (ENT) clinic of Ghaem and Imam Reza Hospitals (Mashhad, Iran) from March 2019 to March 2020.

Inclusion and exclusion criteria

The study included all patients with symptoms and signs of allergic rhinitis who had a positive prick test and those who were between the ages of 14 and 65 years. Patients with polyposis, sinusitis, pregnant women, breastfeeding mother, and individuals with a history of alcohol consumption were also excluded.

Methods

At first, the patients were referred to the central laboratory of Imam Reza Hospital, where the presence of *L. blattarum* infection in patients was evaluated by a parasitologist. A Nasal discharge smear was assessed microscopically for the presence or absence of *L. blattarum* parasite (Figure 1).

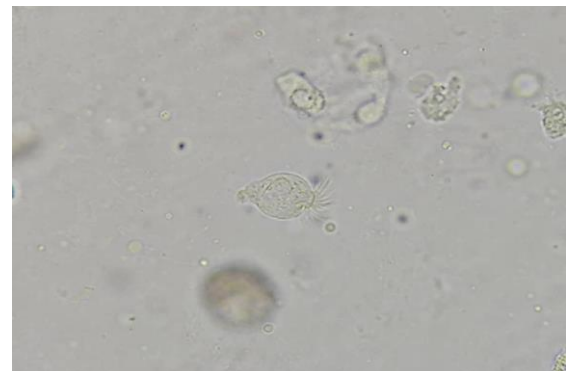


Fig 1: *Lophomonas blattarum*

Nasal secretions of patients were gathered with nose-blowing and examined directly under a microscope at 10X and 40X magnification. We use a nasal swab to take secretion for some patients who cannot give nasal secretions. Diagnosing *L. blattarum* was established by microscopic examination by a parasitologist at Parasitology lab of Imam Reza hospital of Mashhad, Iran. All specimens were examined by direct smear and Giemsa stain. *L. blattarum* is a round or pyriform multiflagellated parasite that measures 20-60 microns. It can be distinguished from the bronchial cell with

these items: *L. blattarum* has no terminal bar, and its nucleus is under the flagellates' origin. Then they were sent to a lab for a prick skin test in which an immunologist explored common antigens throughout the region. After obtaining informed consent from the study subjects, all of them were treated for allergic rhinitis (Nasal saline irrigation three times a day, Cetirizine [Letizen, Actover pharmaceutical company], 10mg per day, and Mometasone spray [Nasonex] twice per day. Symptoms of allergic rhinitis were evaluated after 2 and 4 weeks. Then, patients in two groups with or without *L. blattarum* infections were assessed for their response to allergic rhinitis treatment. Moreover, patients were classified according to the severity of allergic rhinitis symptoms in mild and moderate to severe categories using the ARIA (Allergic rhinitis and Impact on Asthma) classification system (14).

Data Analysis

Statistical analysis was performed using IBM SPSS software version 22.0. To compare quantitative variables in two groups and more (according to the variable distribution), T independent and ANOVA

and their non-parametric equivalent were used. To compare quantitative variables before and after treatment, Paired T-test or its non-parametric equivalent was employed. To study the frequency in the two groups, χ^2 and Fisher tests were used. A P-value less than 0.05 was statistically significant.

Ethical consideration

Written informed consent was obtained from all patients. Moreover, the study protocol was fully approved by the Ethics Committee of Mashhad University of Medical Sciences (ethical code no. IR.MUMS.MEDICAL.REC.1398.479) under Helsinki Declaration guidelines.

Results

We enrolled 56 participants (20 men, 36 women) with a mean age of 30.16 ± 7.96 years in our study. Our findings revealed that 16 (28.6%) individuals tested positive for *L. blattarum* infection, while 40 (71.4%) tested negative. As illustrated in Table 1, there was no significant relationship between *L. blattarum* infection with gender, occupation, type of allergy, allergens, and severity of allergic rhinitis (P-value > 0.05).

Table 1: Distribution of demographic variables and type of allergens due to *L. blattarum* infection

Variable	Total N (%)	<i>L. blattarum</i> infection		P-value	
		Positive	Negative		
Gender	Female	36 (64.3)	10	26	0.990
	Male	20 (35.7)	6	14	
occupation	Housekeeper	17 (30.4)	4	13	0.915
	Student	15 (26.8)	4	11	
	Working indoors	14 (25)	5	9	
Type of allergy	Working outdoors	10 (17.9)	3	7	0.990
	Seasonal	41 (73.2)	12	29	
	Permanent	15 (26.8)	4	11	
Allergens	Weeds	45 (86.5)	11	34	0.370
	Negative	7 (13.5)	3	4	
Allergens	Grasses	2 (3.9)	1	1	0.478
	Negative	49 (96.1)	13	36	
Allergens	Mites	14 (26.9)	3	11	0.732
	Negative	38 (73.1)	11	27	
Allergens	Animals	2 (3.8)	0	2	0.990
	Negative	50 (96.2)	14	36	
Allergens	Foods	21 (42)	4	17	0.515
	Negative	29 (58)	9	20	
Allergens	Latex	2 (3.8)	0	2	0.990
	Negative	51 (96.2)	14	37	
Allergic rhinitis severity	Mild	5 (8.9)	1	4	0.990
	Moderate to severe	51 (91.1)	15	36	

Evaluating the effect of allergy treatment on the severity of allergic rhinitis symptoms in *L. blattarum* positive individuals, the results showed that the symptoms of allergic

rhinitis were significantly reduced, except for eye swelling, which did not demonstrate a statistically significant difference (p: 0.203). Furthermore, a study of

treatment effect on the severity of allergic rhinitis symptoms in *L. blattarum* negative individuals showed that the severity of allergic rhinitis symptoms was significantly reduced (Table 2). In Table 3, the symptoms' severity of the positive and negative

L. blattarum infection before and after the treatment of allergic rhinitis were compared. The obtained results indicated no significant difference in the severity of symptoms between the two groups before and after four weeks of treatment.

Table 2: The effect of treatment on the symptoms' severity

Variable		Symptoms' severity		p-value
		Before treatment	After treatment	
Rhinorrhea	<i>L. blattarum</i> +	4.31	1.70	0.001
	<i>L. blattarum</i> -	3.60	1.92	0.001
Itchy nose	<i>L. blattarum</i> +	3.5	1.43	0.001
	<i>L. blattarum</i> -	2.97	1.87	0.001
Sneezing	<i>L. blattarum</i> +	3.93	1.81	0.001
	<i>L. blattarum</i> -	3.48	1.94	0.001
Nasal obstruction	<i>L. blattarum</i> +	4.12	1.81	0.001
	<i>L. blattarum</i> -	3.87	2.65	0.001
Nasal congestion	<i>L. blattarum</i> +	4.18	2	0.001
	<i>L. blattarum</i> -	3.70	2.55	0.001
Smell disorder	<i>L. blattarum</i> +	3.25	2.06	0.011
	<i>L. blattarum</i> -	2.68	1.97	0.016
PND	<i>L. blattarum</i> +	3.43	2.18	0.001
	<i>L. blattarum</i> -	3.23	2.17	0.001
Watery eyes	<i>L. blattarum</i> +	2.81	1.68	0.023
	<i>L. blattarum</i> -	2.82	1.57	0.001
Eye redness	<i>L. blattarum</i> +	3	1.50	0.001
	<i>L. blattarum</i> -	2.20	1.45	0.001
Eye swelling	<i>L. blattarum</i> +	1.81	1.37	0.203
	<i>L. blattarum</i> -	1.76	2.23	0.006

Table 3: Comparison of symptom severity in *L. blattarum* positive and negative groups before and after treatment

Variable		Before treatment		p-value	After treatment		p-value
		<i>L. blattarum</i> positive	<i>L. blattarum</i> negative		<i>L. blattarum</i> positive	<i>L. blattarum</i> negative	
Rhinorrhea	Grade 1	0	2	0.389	9	17	0.178
	Grade 2	1	8		3	15	
	Grade 3	1	6		3	2	
	Grade 4	6	12		1	6	
	Grade 5	8	12		0	0	
Itchy nose	Grade 1	2	7	0.589	12	21	0.621
	Grade 2	1	8		2	10	
	Grade 3	3	9		1	4	
	Grade 4	7	11		1	3	
	Grade 5	3	5		0	2	
Sneezing	Grade 1	1	6	0.859	10	20	0.350
	Grade 2	1	4		2	11	
	Grade 3	3	6		2	3	
	Grade 4	4	11		1	0	
	Grade 5	7	13		1	5	
Nasal obstruction	Grade 1	0	1	0.436	8	10	0.239
	Grade 2	1	7		4	7	
	Grade 3	2	6		3	14	
	Grade 4	7	8		1	5	
	Grade 5	6	18		0	4	
Nasal congestion	Grade 1	0	3	0.657	7	12	0.608
	Grade 2	1	6		3	6	
	Grade 3	2	6		5	15	
	Grade 4	6	10		1	2	
	Grade 5	7	15		0	5	

Smell disorder	Grade 1	3	14	0.460	7	23	0.282
	Grade 2	2	6		3	3	
	Grade 3	3	2		4	3	
	Grade 4	4	11		2	8	
	Grade 5	4	7		0	1	
PND	Grade 1	3	8	0.990	7	20	0.947
	Grade 2	2	8		4	6	
	Grade 3	2	4		2	5	
	Grade 4	3	8		1	2	
	Grade 5	6	12		2	6	
Watery eyes	Grade 1	4	9	0.928	9	27	0.815
	Grade 2	5	11		4	5	
	Grade 3	1	6		2	6	
	Grade 4	2	6		1	2	
	Grade 5	4	8		0	0	
Eye redness	Grade 1	3	14	0.154	12	27	0.556
	Grade 2	5	14		2	9	
	Grade 3	0	4		1	3	
	Grade 4	5	6		0	1	
	Grade 5	3	2		1	0	
Eye swelling	Grade 1	9	21	0.786	13	32	0.125
	Grade 2	3	11		0	5	
	Grade 3	2	4		3	2	
	Grade 4	2	2		0	0	
	Grade 5	0	2		0	0	

*Grade1: no symptom; Grade2: mild symptom; Grade3: considerable mild symptom; Grade4: mild dysfunction; Grade5: severe dysfunction

Discussion

This study aimed to evaluate the effect of allergy treatment in patients with allergic rhinitis associated with *L. blattarum* infection. The results showed no significant relationship between *L. blattarum* infection with sex, occupation, type of allergy, and allergens. Moreover, the severity of allergic rhinitis symptoms, except for eye swelling, was significantly reduced in patients with a positive *L. blattarum* infection after allergy treatment. To the best of our knowledge, the prevalence of *L. blattarum* infection in allergic rhinitis patients has not been reported. In the current study, 16 patients (28.6%) out of 56 patients with allergic rhinitis tested positive for *L. blattarum*. In previous studies, the reported prevalence has varied based on the geographical region. In a study by Ghaffarian *et al.* (15), in Mashhad, Iran, the prevalence of 40.4% (63 out of 156) was reported in children with pulmonary symptoms between 2016 and 2017. In another study by Berenji *et al.* (16), the reported prevalence of the *L. blattarum* was 33.8% among 133 patients

with respiratory disorders resistant to standard treatments, almost following our study. Besides, 10% of the 40 asthmatic patients tested positive for *L. blattarum* in a study by Mirzazadeh *et al.* (17). Furthermore, two studies examined the prevalence of *L. blattarum* infection in kidney transplant recipients, which in the study by Gheisari *et al.* (18) and Wang *et al.* (19) were reported at 8% (4/50) and 2.8% (4/142), respectively. In this report, there were more infected women than men (six males and ten females), in contrast to the study by Rafael Martinez *et al.*, those who studied *L. blattarum* infection all over the world and found that men had a higher prevalence of disease than women (16 females and 37 males) (20). According to these findings, the prevalence of *L. blattarum*-induced pulmonary infections has dramatically increased; therefore, *L. blattarum* infection must be considered in the differential diagnosis of patients with symptoms like respiratory infection, asthma, dyspnea, fever, and coughs (21,22).

Jorjani *et al.* reported a 37-year-old male with chronic respiratory allergy caused by *L.*

blattarum infection, indicating that this protozoan plays a role in allergic rhinitis development (23). Another study found evidence for a correlation between *L. blattarum* infection with the upper respiratory tract and sinusitis (24). Ribas *et al.* reported a strong correlation between protozoal forms of house-dust mites and protozoa in asthmatic sputum and nasal secretions of allergic rhinitis patients, suggesting a correlation between *L. blattarum* infection and these diseases (25).

Our study is consistent with those before we found that the prevalence of *L. blattarum* infection in patients with allergic rhinitis was 28.6%, and allergy treatment had a significant effect in both groups with and without *L. blattarum* infection.

Conclusion

In conclusion, this study showed that the prevalence of *L. blattarum* infection in patients with allergic rhinitis was about 28.6%. Furthermore, allergy treatment has the same effect on allergic rhinitis patients with or without *L. blattarum* infection and *L. blattarum* infection do not affect treating patients with allergic rhinitis (except in eye swelling). However, further studies are recommended to assess the association of *L. blattarum* infection with the effectiveness of allergy treatment and the severity of symptoms.

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