



***Lophomonas blattarum* in Asthmatic Patients and Control Group**

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ABSTRACT

Lophomonas blattarum (L.b) is a parasitic protozoa which is important in the medical practice of respiratory patients. It is transmitted through aspiration, and it is a potential element in bronchial and respiratory infections among the patients with pneumonia and asthma. The purpose of this study was the investigation of *Lophomonas blattarum* frequency in asthmatic patients and control group. Participant in this crosssectional study was patients who referred to respiratory specialist clinic of Imam Reza Hospital. Direct smear of samples of patient's phlegm and giemsa stained smear were prepared and observed under light microscope and this was done for control group as well. Then the prevalence of the parasite is measured by investigating the samples. There were 4(10%) positive samples among 40 asthmatic participants. 3 women and 1 man with average age of 43years. All the four patients were controlled regarding the severity of the disease. None of the control group members was positive for (L.b). 10% of asthmatic patients were infected with *Lophomonas blattarum* whose symptoms eliminated after treatment with metronidazole. It is therefore suggested to test asthmatic patients for *Lophomonas blattarum* who suffer from respiratory symptoms despite the proper control of their disease.

Key words: *Lophomonas blattarum*, Asthma, Mashhad, Imam Reza Hospital

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INTRODUCTION

Lophomoniasis is a human infection due to *Lophomonas blattarum* (L.b). Stein first defined *Lophomonas blattarum* in 1860 when observed it in cockroaches' middle bowel [1]. First pulmonary infection was reported by Chen and Meng in 1993, all of cases found in south of China [2, 3]. Patients with respiratory asthma, allergic rhinitis, and immune deficiency, especially AIDS, organ transplantation, cancer and treatment with corticosteroids are the most infected by *Lophomonas blattarum* protozoa [4, 5]. *Lophomonas blattarum* morphology is well explained under

optical microscope. Its length is 20 to 60 (μ) micron and its width 12 to 20 μ . The smallest one shows better spherical form. Larger ones are spherical-ellipse. Cytoplasm are seen as granular and food phagocytosis. The nucleus is placed as a circular and dark body next to cilium. There exists a group of regular and equal cilium on one of the poles which are small and distinct moving freely around the protozoa [3]. Cilia are almost as big as the body and uncountable which help the organisms move fast and rotational [6].

These multi-cilia anaerobic protozoa are commensally coexist in middle bowel of cockroaches, termites, mites and bustard. As a coexistent, this protozoa uses part of the host's food but has no harm to his body. *Lophomonas blattarum* is an endocommensals parasite like

some bacteria, fungi, and a protozoa called *Nictotherus ovalis* [3, 7]. Cockroaches and mites, while moving around, infect many things including dust. Dispersion of dust is a transmission agent which goes to the lungs of individuals as well as susceptible patients [8]. Mites that are commonly found in beds, rooms, kitchens, and greenhouses are the habitats of *Lophomonas blatttrum*. Mites are considered a source of high levels of allergens [9]. Cysts of blatttrum species enter the human body through breathing, or consuming water and food infected and in contact with soil contaminated with cockroaches and mite stool, which finally go to bronchial secretions. There they leave the cyst form under conditions of favorable temperature and humidity. This may be a logically acceptable theory for *Lophomonas blatttrum* transmission [2, 10].

Studies have shown that asthmatic individuals have had a favorable context for the development of these protozoa. Of course those elements such as using inhaled steroids and living in wet places cannot be ignored. The immune system is moderated by breathing steroids, so the growth of protozoa is facilitated. Moisture, old weather, and dust in the air create pulmonary symptoms commonly found in pulmonary patients. Dust in the air contains microbes, fungi, viruses, protozoa, flower pollen, ashes, and the remains of the mites, all of which remain for a long time in the air and easily enter the respiratory system of the individual [11].

Patients with immune deficiency are prone to attract significant numbers of infections and pathogens, one of which is *Lophomonas blatttrum* [8]. This parasite keeps itself tight to the bronchial mucus by secreting special material to easily cause a sick person to cough. The reaction depends on the severity of the asthma and burden of infection [6]. *L. blatttrum* proteolysis enzymes destroy the structure of bronchial epithelial cells and destroy the lung epithelium. Synthesis of protease proteins causes lung inflammation [10]. *Lophomonas blatttrum* grows rapidly inside the multiple airways to produce in the interior bronchi a yellow and white mass of sputum with a diameter of one centimeter to bring about an obstruction which is normally accompanied with a bacterial infection or pulmonary abscess and pulmonary problems [6]. There is a direct relation between protozoan and the existence of monocyte and macrophage [12].

Asthma is diagnosed by wheezing, shortness of breath, dyspnea, coughing, and also the loss of exhaust air. The length and severity of the symptoms are different among the individuals. They may be created by multiple factors such as exercise, allergenic substances, and exposure to stimuli, climate change, or viral respiratory infections. Exhaust air flow restriction may occur by itself or in response to medications for a limited period of time from some weeks to multiple months. Asthma causes harsh responses to direct or indirect stimuli in airways. In addition, it causes chronic inflammation of airways, too. These features remain even after disappearance of symptoms and returning to the normal function of lungs, but they can be controlled by treatment. Asthma exacerbation is defined by increased short breaths, coughing, sneezing, and chest pain or a combination of these symptoms. According to studies the presence of cockroaches in the living environment of patients exacerbates the asthma symptoms [13]. In this study we want to evaluate the prevalence of *lophomonas blattarum* in the sputum samples of asthmatic patients in Mashhad, Iran.

MATERIAL AND METHODS

The participants of this project are those patients referring to respiratory specialist clinic at Imam Reza Hospital, Mashhad Iran. All of them signed informed consent. They first filled in a questionnaire including statistical questions and some subjects related to the intensity of their asthma. Feno test and peakflowmeter were done on the patients. Nebulizer device was used to produce sputum sample. The sample was taken in a sterile container. Direct smear and giemsa stained smear were prepared to investigate for *Lophomonas*, (Fig 1). Control group was chosen from the healthy members of the patient's family regarding their average age, their sputum were examined by direct smear and giemsa stained smear for *Lophomonas*. Then the prevalence of this parasite in samples was statistically measured.

This study is done with ethical permission IR.MUMS.fm.REC.1394.580 approved by Mashhad University of Medical Sciences, Mashhad, Iran.

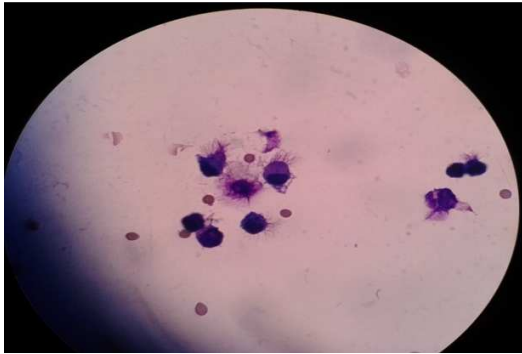


Figure1: *Lophomonas blattarum* in sputum sample of asthmatic patients Magnification $\times 1000$. (Giemsa stain)

RESULTS

80 participants are divided into two 40-member groups of patients and control, each with a sputum sample. Participants were 17 to 80 years old. None of control group members had any sign of asthma previously.

4 samples (10%) among 40 participants were positive regarding *Lophomonas blattarum*. There were three women (75%) and one man (25%) in the age range of 29 to 54 with the average age of 43 and all of them is the residents of Mashhad, Iran. All four had sinusitis in addition to asthma. All of them were in proper position from asthma severity. None of members in control group was positive in having *Lophomonas blattarum*. Fischer exact test showed no significant difference between asthmatic patients and control group for finding L.b in sputum sample.

DISCUSSION

This study was the investigation of *Lophomonas blattarum* prevalence in asthmatic patients and control group in Mashhad, Iran. Four patients (10%) among 40 participants were positive regarding *Lophomonas blattarum*. All positive cases in the asthmatic patients' group were treated by metronidazole, and their recovery was good enough. According to a case report of sinusitis due to L.b from Mashhad [14] which showed weak response to metronidazole with no recovery signs, it became clear that the patient used steroid spray at the same time. After stopping the steroid spray usage, the patient responded to metronidazole treatment. Three patients with positive samples, in this study, used steroid spray. It is therefore concluded that asthmatic patients should be examined for the *Lophomonas blattarum* presence in their sputum by smear test before beginning to

use steroid spray. So it is suggested to our lung specialist colleagues to take *Lophomonas blattarum* smear test from all asthmatic patients before deciding for their treatment, and then produce the asthma treatment protocol with or without metronidazole based on positive or negative responses to the presence of *Lophomonas blattarum*.

The first patient was a 52 years woman with 15 years history of asthma who had severe cough and wheezing in recent months. She suffered from exacerbation of asthma symptoms despite frequent and regular use of spray. She had none of the features such as dust, humidity, termite, or cockroach around her place of life. Examining her sample of white sputum approved the presence of *Lophomonas blattarum*. So it was necessary for the pulmonologists to consider the changes in the patient's asthmatic symptoms and no response to treatment.

The second case was a 54 year old woman with three years history of asthma. She has had wheezing and coughing since a year ago. She lived in Mashhad suburb full of dust and termites. The patient took on metronidazole and referred after a month with a reduction in symptoms. She was happy with her recovery process. The examination of sputum showed no L.b after metronidazole therapy. *Lophomonas* lives in the bowels of termites and cockroaches that need a special protease to digest their food. It is approved that the presence of protease plays an important role in destruction of tight junctions of pulmonary cells. The results of this study agree with Tyagi et al at India in 2016. Metronidazole treatment has a great role in controlling asthmatic symptoms [15]. The third patient was 38 year old man with ten years asthma exposed to direct soil and moisture contacted by termites and cockroaches, because of his job. Despite the frequent use of corticosteroid spray, he complained of frequent coughing and sneezing symptoms. *Lophomonas blattarum* protozoa was seen in his yellow color sputum. L.b lives peacefully in middle bowel of termites and cockroaches. In cockroaches' middle bowel it is one of digestion facilitators, specifically cellulosic materials; and as a coexist, this protozoan uses part of its host's food [3, 7]. Termites and cockroaches infect everything in their way while crawling. Dust dispersion moves pathogen factor into the lungs of people while breathing [8]. *Lophomonas blattarum* enters human body through breathing, or while drinking contaminated water,

or eating contaminated food, and also touch of dust infected by termite's and cockroach's stool; under favorable temperature and humidity conditions, excystation take place in the bronchial airways [10, 1].

The forth patient was a 29-year old, housewife, whose asthma and *Lophomonas blattarum* presence in her sputum were diagnosed simultaneously. She was short of breath, with chest pain and dry cough. Her sputum was normal but contained L.b. The patient's living environment had cockroaches, moisture and dust.

CONCLUSION

Finally, regarding all mentioned above, despite no significant difference between patients and control group in our study for finding L.b , it is recommended to checkup all asthmatic patients for the presence of *Lophomonas blattarum* if they suffer from bronchial symptoms or coughing despite properly controlling their asthma. Since the appearance of sputum may be normal despite the presence of *Lophomonas blattarum*, it is necessary to test the sputum if the respiratory symptoms are exacerbating. At the end, as the patient shows recovery after treatment with metronidazole, it is clear that this parasite plays a great role in exacerbating disease symptoms. It is therefore important to diagnose the problem in time to reduce mortality and morbidity of asthmatic patients.

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Conflict of Interest

There is no conflict of interest in this article.

Authors Contribution

Study concept and design: Fariba Berenji, Aliakbar Shamsian and Abdolmajid Fata. Acquisition of data: Maryam Salehi. Analysis and interpretation of data: Fariba Berenji, Maryam Salehi, Farzaneh Mirzazadeh. Drafting of the manuscript: Farzaneh Mirzazadeh, Fariba Berenji. Critical revision of the manuscript for important intellectual content: Fariba Berenji. Statistical analysis: Maryam Salehi. Administrative, technical and material supports:

Mahnaz Amini, Leila Ghofraniha, Mahmoud Parian, Maryam Nakhaei and Farzaneh Mirzazadeh.

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