



## A Study about Clinical Symptoms and Laboratory Signs of Adult and Pediatric Patients with *Lophomonas blattarum*

Mona Talebian<sup>1</sup>, Fariba Berenji<sup>2\*</sup>, Mahnaz Amini<sup>3</sup>, Sayed Javad Sayedi<sup>4</sup>, Aliakbar Shamsian<sup>5</sup>,  
Monavar Afzalaghaee<sup>6</sup>, Abdolmajid Fata<sup>7</sup>, Mahmoud Parian<sup>8</sup>, Maryam Nakhaei<sup>9</sup>,  
Bibi Razieh Hosseini farash<sup>10</sup>

<sup>1</sup>MSc in Medical Parasitology, Department of Parasitology and Mycology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>2</sup>MD, Ph.D., Professor of Medical Parasitology, Department of Parasitology and Mycology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>3</sup>MD, Assistant Professor of Pediatric Pulmonology, Lung Disease Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

<sup>4</sup>MD, Assistant Professor of clinical Pediatric, Neonatal Research Center, Dr. Sheikh hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>5</sup>Ph.D., Associate Professor of Medical Parasitology, Department of Parasitology and Mycology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>6</sup>MD, Assistant Professor of Community Medicine, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>7</sup>DVM, Ph.D., Professor of Medical Parasitology, Department of Parasitology and Mycology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>8</sup>MSc in Medical Parasitology, Department of Parasitology and Mycology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>9</sup>PhD student in Medical Parasitology, Department of Parasitology and Mycology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>10</sup>PhD in Medical Parasitology, Department of Parasitology and Mycology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

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### ABSTRACT

*Lophomonas blattarum* is an emerging important cause of bronchopulmonary infections. According to previous studies in our region and high prevalence of this infection, we decided to review clinical symptoms and laboratory signs of patients with *Lophomonas blattarum* who were admitted in Imam Reza and Dr. Sheikh hospitals located in Mashhad, Iran. In this cross sectional study, we reviewed the records of patients with *Lophomonas blattarum*, who were admitted in different wards of Imam Reza and Dr. Sheikh hospitals in 2014-2016. The checklist and required information were provided for each patient and then were analyzed by using chi-square and Fisher's Exact Test's; finally the results are in tables. In this study, the most common clinical symptoms in adults were, fever (35%), weakness (27.5%), weight loss (27.5%), most respiratory symptoms included coughing (55%), dyspnea (50%), hemoptysis (20%), the most prevalent predisposing of Lophomoniasis was cancer (27.5%), most laboratory signs : increased neutrophil count (67.5%) and lymphocyte reduction (62%). The main symptoms in children were, fever (35.1%), most respiratory signs and symptoms: coughing (85.7%), dyspnea (37.7%), most laboratory symptoms: lymphocyte reduction (39%) and eosinophilia (19.5%). We concluded the most common clinical signs and symptoms and laboratory signs among adults and children were fever, coughing, dyspnea, lymphocyte reduction and eosinophilia.

**Keywords:** Broncho Alveolar Lavage (BAL), *Lophomonas blattarum*, Pulmonary Infection, Iran

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**Corresponding author:** Fariba Berenji

**e-mail** ✉ berenjif@mums.ac.ir

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### INTRODUCTION

*Lophomonas blattarum* is a multi-flagellate protozoan and belonging to the suborder of

*Excavata*, and the phylum of *Parabasalida*, observed by Stein in cockroach's intestine for the first time [1]. Two species of *Lophomonas* have been named *blattarum* and *striata*. *Lophomonas blattarum* mostly lives in the posterior intestine of some arthropods such as cockroaches, termites and mites and causes pulmonary infections in human [2]. Firstly, Chen and Meng [2, 3] reported human pulmonary infection caused by *Lophomonas* in 1933.

It is reported 133 cases infected by *L. blattarum* all over the world through different articles and studies. The first example of pulmonary infection by *Lophomonas blattarum* is reported in the south of China, in 1992, a college student with coughs, weight loss, and chest pain [1].

All diagnosed patients have had a history of pulmonary problems, some of whom with deficiencies in the immune system, and renal or liver transplantation. Kudo studied the cystic form of *L. blattarum* [2]. Berenji *et al.*, (2015) reported the first case of *L. blattarum* in Iran, in a patient with respiratory problem and sinusitis who responded to metronidazole treatment [3]. Another study by Berenji *et al.* (2016) considered 133 samples, among which there were 50 *Lophomonas* positive cases [4].

Clinical symptoms of patients with *L. blattarum* are fever, chills, cough with hemoptysis, dry cough, pulmonary infection, dyspnea, chest pain, wheezing, and so on [1, 5]. Adult patients may have some other pulmonary infections such as asthma, pneumonia, bronchiectasis, and similar pulmonary abscesses. Coughing has been constantly reported in all cases in different studies. Coughing is observed with sputum, with yellow sputum, or with hemoptysis. Body temperature is also reported to increase from 37.5 to 39. Patients' blood samples indicate 35% rise in eosinophilia [2].

Regarding high prevalence of patients in different studies considering this geographical region (Mashhad, in north-east of Iran), we decided to study and classify clinical and laboratory signs of such patients through their records.

## MATERIALS AND METHODS

### Ethical consideration

The research proposal has been approved by the Ethics Committee of Mashhad University of Medical Sciences (Ethical code no.IR.MUMS.fm.REC.1395-599) in accordance with Helsinki Declaration guidelines. The patients, who agree to participate and signed the consent forms, were taken under study. Children's permissions attending were given by their legal guardians.

### Study population

The sample size was determined based on patients with *L. blattarum*, who were admitted in different parts of Imam Reza and Dr. Sheikh hospitals in Mashhad. Based on prevalence and frequency of clinical signs, the sample size could be investigated with 95% confidence level with a margin of error of less than 10 %.

### Data collecting and analysis

The information of patients who were hospitalized into Imam Reza (adults) and Dr. Sheikh hospitals (pediatrics), and had a positive test for *L. blattarum*. For all patients bronchoscopy were done and Bronchoalveolar lavage (BAL) samples were collected. All samples sent to Parasitology lab of Emam reza Hospital of Mashhad. Direct smears and gimsa stained BAL samples were examined under light microscopy and parasitologist and lab technicians diagnose the *Lophomonas blattarum* protozoa and respiratory epithelium cells by using some criteria listed below: *Lophomonas* is round or oval shape (20-60  $\mu\text{m}$ ) and has two layer flagellum which motile and bronchial epithelial cell is cylindrical and has cilia which originated from terminal bar that *Lophomonas* does not have any terminal bar. The nucleus of protozoa is not visible in some of them but in bronchial ciliated cell it is characteristic at the bottom of the cylindrical cell. It must be mentioned there is no culture media for *Lophomonas* and there is not molecular diagnostic method for this protozoa yet. The only diagnostic method for *Lophomonas blattarum* is examining respiratory secretion under light microscopy. The checklists were prepared for recording the finding of patients, then the obtained data were analyzed by SPSS software (IBM SPSS Statistics 24) using chi-square and Fisher's Exact Test's.

**RESULTS**

The total sample size was 117 infected patients with *L. blattarum* including 40 adults and 77 pediatric. The number of males participated in this study was 19 (47.5%) and 44 (57.1%) among adults and pediatrics, respectively. The clinical signs of 21 (52.5%) adults and 33 (42.9%) children who were female have also recorded. Pneumonia has been reported in 20% of adults and 23.4% of children. The rate of bronchitis was 2.5% and 23.4% in adult and children respectively.

**Table 1: Clinical symptoms in adults and pediatrics with *Lophomonas blattarum* infection in 2014-2016**

Clinical Symptoms		Adult patients	Pediatric patients	Chi-Square p-value
		No. (percentage)	No. (percentage)	
Chill	Yes	7 (17.5)	0	<b>0.000*</b>
	No	33 (82.5)	77 (100)	
Sweating	Yes	5 (12.5)	0	<b>0.004*</b>
	No	35 (87.5)	77 (100)	
Weakness	Yes	11 (27.5)	2 (2.6)	<b>0.000*</b>
	No	29 (72.5)	75 (97.4)	
Weight loss	Yes	11 (27.5)	0	<b>0.000*</b>
	No	29 (72.5)	77 (100)	
Fever	Yes	14 (35)	27 (35.1)	<b>0.99</b>
	No	26 (65)	50 (64.9)	

\* Fisher's Exact Test's

**Table 2: Respiratory signs and Symptoms in adults and pediatrics with *Lophomonas blattarum* Infection in 2014-2016**

Respiratory Symptoms		Adult patients	Pediatric patients	Chi-Square p-value
		No. (percentage)	No. (percentage)	
Coughing	Yes	22 (55)	66(87.5)	<b>0.000</b>
	No	18(45)	11(14.3)	
Hemoptysis	Yes	8(20)	3(3.9)	<b>0.004*</b>
	No	32 (80)	74 (97.1)	
Chest pain	Yes	4(10)	1(1.3)	<b>0.000*</b>
	No	36(90)	76 (98.7)	
Dyspnea	Yes	20(50)	29(37.7)	<b>0.16</b>
	No	20(50)	48(62.3)	

\* Fisher's Exact Test's

**DISCUSSION**

The total sample size was 117 patients including 40 adults and 77 juveniles (from 1-day infant to 18-year-old youngster). In present study, the number of infected women was greater than men (21 female and 19 male), opposed to that by Rafael Martinez et al., which reviewed *Lophomonas blattarum* all over the world and

concluded a higher rate of infection with *Lophomonas* in men than women (37 male and 16 female) [2].

**Table 3: Neurological symptoms in adults with *Lophomonas blattarum* infection in 2014-2016**

neurological symptoms	Adult patients	
	Yes	No. (percentage)
Reduced consciousness	Yes	6 (15)
	No	34 (85)
Early fatigue	Yes	3 (7.5)
	No	37 (92.5)
Headache	Yes	3 (7.5)
	No	37 (92.5)
Imbalance	Yes	3 (7.5)
	No	37 (92.5)

**Table 4: Laboratory signs in adults and pediatrics with *Lophomonas blattarum* infection in 2014-2016**

laboratory signs		Adult patients	Pediatric patients	Chi-Square p-value
		No. (percentage)	No. (percentage)	
Eosinophilia	Yes	1(2.5)	15 (19.5)	<b>0.11</b>
	No	39(97.5)	62 (80.5)	
Increased neutrophils	Yes	27 (67.5)	1 (1.3)	<b>0.000</b>
	No	13(32.5)	76 (98.7)	
Decreased lymphocyte	Yes	26 (65)	30 (39)	<b>0.007</b>
	No	14 (35)	47 (61)	
Leukocytosis	Yes	6 (15)	7 (9.1)	<b>0.58*</b>
	No	34 (85)	69 (89.6)	
Leukopenia	Yes	4 (10)	0	<b>0.12*</b>
	No	36 (90)	77 (100)	

\* Fisher's Exact Test's

**Table 5: Underlying conditions in adults and pediatric with *Lophomonas blattarum* infection in 2014-2016**

Background illness		Adult patients	Pediatric patients	Chi-Square p-value
		No. (percentage)	No. (percentage)	
Cancer	Yes	11 (27.5)	0	<b>0.000*</b>
	No	29 (72.5)	77 (100)	
Organ transplant	Yes	2 (5)	0	<b>0.11*</b>
	No	38 (95)	77 (100)	
HIV( AIDS)	Yes	1 (2.5)	0	<b>0.34*</b>
	No	39 (97.5)	77 (100)	
Tuberculosis	Yes	4 (10)	0	<b>0.12*</b>
	No	36 (90)	77 (100)	
Asthma	Yes	2 (5)	5 (6.5)	<b>1*</b>
	No	38 (95)	72 (93.5)	
Sinusitis	Yes	4 (10)	0	<b>0.12*</b>
	No	36 (90)	77 (100)	
Heart disease	Yes	3 (7.5)	2 (2.6)	<b>0.33*</b>
	No	37 (92.5)	75 (97.4)	

\* Fisher's Exact Test's

**Table 6: Radiographic Signs in adults with *Lophomonas blattarum* infection in 2014-2016**

Radiographic Signs	Adult patients	
		No. (percentage)
Pleural effusion	Yes	16(40)
	No	24(60)
Lung collapse	Yes	11(27.5)
	No	29(72.5)
Fibrotic bands	Yes	7(17.5)
	No	33(82.5)
Sub pleural nodules	Yes	7(17.5)
	No	33(82.5)

**Table 7: Culture of Broncho Alveolar Lavage (BAL) samples in adults with *Lophomonas blattarum* Infection in 2014-2016**

The culture of BAL samples	Adult patients
	No. (percentage)
<i>Candida</i>	5(12.5)
<i>E.coli</i>	2(5)
<i>Acinetobacter</i>	1(2.5)
<i>Mycobacterium tuberculosis</i>	1(2.5)
<i>Corynebacterium</i>	1(2.5)

The age of patients ranges from 17-84, with an average of 59 years old, similar to that obtained by Rafael Martinez *et al.*, in a review article stated a range age of 15-95 for patients with a mean of 45 years old [2].

In order to follow this discussion, we have reviewed the obtained clinical symptoms, laboratory signs and also radiologic signs among the adult patients. Most common clinical symptoms in adults were weakness (27.5%), chill (17.5%), sweating (12.5%), and weight loss (27.5%), whereas pediatric patients did not show these signs ( $P < 0.05$ ). The only clinical symptom has been observed in children was fever (35.1) with a similar percentage in adults (35 %). They were almost same as those found by Zhang *et al.* They diagnosed a patient with clinical symptoms including sweating, weight loss, coughs with yellow sputum, and chest pain, among patients with bronchopulmonary related to *L. blattarum*, and treated the patient [1].

In this investigation, the frequent respiratory signs and symptoms were cough (55%), chest pain (10%), dyspnea (50%), and hemoptysis (20%). They were similar to the report by Verma *et al.* about a man of 60 to be infected by *L. blattarum* whose clinical symptoms were dyspnea, wheezing, fever, loss of appetite, and neutrophil

elevation in blood tests [6]; the same as our findings.

The clinical signs observed in the present study were same as Zeng *et al.*, who reported a case report in a 70-year farmer infected by *L. blattarum* with symptoms of coughs, sputum, fever, and hypertension, whose response to treatment with tinidazole was positive [7].

Tyagi *et al.*, reported a patient infected with *L. blattarum* with dyspnea, wheezing, and coughing who had been treated by metronidazole [8]; which is in accordance with our findings.

In another study, Ran Li *et al.*, reviewed 149 patients with lophomoniasis along with bronchopulmonary and found out that 53% and 3.4% of patients had pneumonia and chronic coughing, respectively [9]; in our study pneumonia frequency was 20% in adults and 23.4% in children ( $P > 0.05$ ). Chronic coughing was significantly higher in pediatrics (87%) in comparison with adults (55%) ( $P < 0.05$ ). Bronchitis has also been diagnosed in 2.5% of adults and 23.4% of children which showed a significant difference between two groups ( $P < 0.05$ ). They could be related to immune systems of patients and background disease of patients.

In this present study, however the neurological signs including reducing consciousness (15%), headache (7.5%), early fatigue (7.5%), and imbalance (7.5%) were frequently seen; none of the previous investigations have considered neurological symptoms in adult patients with lophomoniasis. Authors believe that a number of these neurological indicators might be explained due to hypoxia and dyspnea in some patients. The headache could be resulted from sinusitis associated with a *Lophomonas* pulmonary infection which would be explained more through this paper.

The results of this study indicate that cancer (27.5%) in comparison to pediatric patients ( $P < 0.05$ ), and organ transplant (5%), HIV AIDS (2.5%), tuberculosis (10%), asthma (5%), and sinusitis (10%) are the main factors to make an individual susceptible to lophomoniasis have not showed a statistically significance with pediatric patients ( $P > 0.05$ ), which are in accordance with

the study done by several researchers in different part of the world [3, 4, 9].

In the present study, the results of white blood cell count show a surge in neutrophil amount in 67.5% of cases, a fall in lymphocyte in 62%, leukocytosis in 15%, leukopenia in 10% and eosinophilia in 2.5% of patients. Opposed to the high eosinophilia rate stated by Martinez *et al.*, a low rate of eosinophilia (2.5%) has been reported in the present investigation that is similar to the findings obtained by Li *et al.* Also, the obtained results were similar to those findings by Liu *et al.*, who observed laboratory signs like a rise in eosinophils and neutrophils in asthmatic patients with clinical symptoms such as fever, cough, and sputum [10].

In our study, pleural effusion (40%) and lung collapse (27.5%) were the highest percentages in radiographic findings, after which came fibrotic bands (17.5%) sub pleural nodules (17.5%); contradictory to those found by Martinez *et al.*, who concluded the most radiographic results among patients with lophomoniasis were infiltration and pulmonary nodules [2].

In this study, culture of BAL samples showed the highest percentage for *Candida* (12%), followed by *E.coli* (5%), *Acinetobacter* (2.5%), *Mycobacterium tuberculosis* (2.5%) and *Corynebacterium* (2.5%); similar to findings by Verma *et al.* who reported a 60- year man infected by *L. blattarum*, whose sputum sample was positive for *Mycobacterium tuberculosis* [6].

Moreover, the clinical signs of children were statistically analyzed and showed the number of pediatric (77) patients, 65.8%) with lophomoniasis was more than adults (40, 34.1%). The age ranges of pediatric patients were from 1 month to 13 years old, with an average age of 3. There is an study about children with lophomoniasis by Zerpa *et al.*, who found 3 patients with different age range [12]; and Liu *et al.* among the children of 1-12 years old [11]. The findings of two mentioned articles are in accordance with the present study but the number of our pediatric patients is higher than any article in the world and it is more prevalent in Iranian patients than other country.

Regarding pediatrics' laboratory signs and clinical symptoms, the most common clinical symptoms

were fever (35.1%), and weakness (2.6%). Respiratory signs and symptoms among pediatric were cough (85.7%), dyspnea (37.7%), congestive discharges (28.6%), hemoptysis (3.9%), chest pain (1.3%) which agree with results obtained from Zerpa *et al.*, who studied *L. blattarum* in young children under 12 having a resistant chronic pulmonary infection to treatment, and chronic coughs [12]. It was also same as the findings by Liu *et al.*, on children with fever, cough, hemoptysis, wheezing, chest pain, and sinusitis[11].

Pediatric patients in our study also had gastrointestinal symptoms including vomiting (13%) and nausea (1.3%). Neurological signs were not observed in children.

In the present study, underlying conditions among pediatrics were asthma (6.5%) and heart disease (2.6%), in accordance with results by Zerpa *et al.*, in which two patients had congenital heart disease [12].

Although, a significant decrease in lymphocyte amount (39% of cases) and elevated neutrophils (1.3% of cases) were observed among pediatrics in comparison to adults ( $P < 0.05$ ), leukocytosis (9.1% of cases), and eosinophilia (19.5% of cases) in pediatrics have not showed a statistically significance with adults ( $P > 0.05$ ) which are in accordance to the study performed by Liu *et al.*, who reported leukocytosis and eosinophilia in children [11].

On the whole, the results demonstrated that the most common clinical symptoms and laboratory signs among adults and children were fever, coughing, dyspnea, lymphocyte reduction and eosinophilia. Consequently, lophomoniasis have to be considered among other infective diseases in the patient who suffers from the mentioned signs.

#### **Conflict of Interests**

The authors declare that there is no conflict of interest.

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