

The Rate of Detection of *Legionella pneumophila* IgG Antibodies among Patients with Chest Infection in Major Hospitals in Khartoum State, Sudan

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Abstract

Back ground: *Legionella pneumophila* has been increasingly recognized as an emerging pathogen responsible for atypical pneumonia and community acquired pneumonia incidence worldwide. There is an estimated incidence of 25,000 to 35,000 cases per year. Cases are seen more in the summer, when air conditioning is being used most often. Out of the individuals who come down with Legionnaires' disease, 5-30% dies, if untreated mortality can reach up to 80 %. In the US there is an incidence of 8,000 to 18,000 cases reported per year. Approximately only 5-10% of the total *L.pneumophila* cases are actually reported⁽¹⁾.

The major risk through exposure to contaminated water sources that become aerosols e.g.: air conditioning system, cooling towers and shower in hotels, camp sites and cruise ship⁽²⁾.

This study was conducted to study the association of *L.pneumophila* with chest infection among patient's attending major hospitals in Khartoum state and the risk factor predisposing to *L.pneumophila* infection.

Materials and Methods: A total of 300 subject (Both children and adults presenting to study areas with symptoms of chest infection (pneumonia) were included in the study. 5 mls of venous blood were collected from each patient under study. The sera were separated and tested for *L.pneumophila* IgG antibodies using Enzyme Linked Immunosorbent assays (ELISA) (Euroimmun).

Results: The rate of *Legionella pneumophila* were found to be (68) (22.7%) of 300 cases serologically positive for *Legionella pneumophila* IgG antibodies. The highest prevalence of *Legionella pneumophila* IgG (36.8%) was found in the age group (31-45 years). Clinical symptoms cannot be distinguished between the disease and other pneumonia. This study

confirmed that the legionella may be an important water pathogen and important cause of community acquired pneumonia and atypical pneumonia.

Key words: *Legionella pneumophila*, ELISA, Chest infection, Pneumonia, Antibodies IgG.

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Introduction

The Legionellaceae were not documented until 1976 when detrimental outbreak of pneumonia occurred in Philadelphia at an American legion convention. Thirty four of the 221 people who became ill after exposure died within the first few weeks after the convention ⁽³⁾.

L. pneumophila infection can cause Legionnaires' disease, a severe form of pneumonia ^(4, 5). The symptoms of Legionnaire's disease include confusion, headache, diarrhea, abdominal pain, fever, chills, and myalgia as well as a non-productive cough ⁽⁵⁾. Mortality rate is reported to be 15-25% ^(8, 4). Pontiac fever is a non-pneumonic form of *L. pneumophila* infection ⁽⁷⁾. Symptoms are flu-like. Pontiac fever is self limited and requires no hospitalization or antibiotic therapies ⁽⁸⁾. There are no reported deaths associated with Pontiac fever; Pontiac fever usually does not require antimicrobial therapy. *L. pneumophila* is of worldwide prevalence ⁽⁹⁾. Infections are reported in North and South America, Asia, Australia, New Zealand, Europe and Africa. *L. pneumophila* is the cause of 1-2% of all pneumonia cases in adults ⁽⁹⁾. The number of cases reported increases in the summer and fall in winter ⁽⁶⁾. During an epidemic of Legionnaire's disease, only 2- 7% of people exposed develop the infection ⁽¹⁰⁾. *L.pneumophila* can be transmitted by aerosols and aspiration of contaminated water ^(6, 8, 4). Incubation period for Legionnaires' disease is 2-14 days ^(8, 10). Pontiac fever has an incubation period of 30 to 90 hours (with 24-48 hours being most common) ⁽⁷⁾. No person-to-person transfer has been documented ⁽¹¹⁾. *L. pneumophila* is found naturally in most fresh water sources, including lakes, ponds, and rivers ^(6, 12, 13). It is found in cooling towers, plumbing systems, water heaters, and warm water spas ^(8, 9). It has also been

isolated from soil samples⁽¹⁴⁾. *L. pneumophila* is susceptible to erythromycin, clarithromycin, azithromycin, tetracycline, moxifloxacin, and levofloxacin^(6, 8). Aminoglycosides such as gentamicin, kanamycin and streptomycin are active against *L. pneumophila*^(15, 16); however, there are mutant strains that show resistance to streptomycin⁽¹⁷⁾. Beta-lactam antibiotics are ineffective against *L. pneumophila*⁽¹⁸⁾. Diagnosis can be confirmed via identification of *L. pneumophila*, often isolated from respiratory secretions, by culturing, immunofluorescent staining, urine antigen tests, PCR or serologic tests^(8, 19).

Despite the outbreak in many countries no studies were carried out in Sudan to determine the prevalence of *L.pneumophila* as a cause of community acquired pneumonia. This study is conducted to determine the rate of infection with *L.pneumophila* among patient admitted to different major hospitals in Khartoum State with chest infection and pneumonia.

Materials and Methods

During the period from September 2012 to September 2013 a total of 300 subjects presenting to the selected major hospitals in Khartoum state with symptoms of chest infection and pneumonia were randomly selected to participate in this study: After obtaining the verbal consent of each patient to participate in the study. There after Five mls of venous blood were collected from each study patient under aseptic condition and drawn into sterile plain container, allowed to clot, then centrifuged for 4 minutes to obtain serum. The serum was transferred to another sterile plain container (Cryo Tube) and stored at -20°C. The stored sera were later tested for *Legionella pneumophila* (IgG) antibodies using Enzyme Linked Immunosorbent assays ELISA (Euroimmun).

Results

In this study a total of 300 serum samples from patients with chest infection and pneumonia were tested. The overall seroprevalence of *Legionella pneumophila* IgG antibodies was found to be (68) (22.7%) of 300 cases. The highest prevalence of *Legionella pneumophila* IgG (36.8%) was found in the age group (31-45 years) table (1). The rate of infection with *Legionella pneumophila* was higher among patients who presented with running nose (43.8%), haemoptysis (36.4%), and abdominal disorder (29.2%) table (2).

Table (1): Distribution of *Legionella pneumophila* according to age group

Age group (Year)	Total examined	WNF IgG +ve	
		Frequency	Percentage %
≤15	101	13	12.9%
16-30	57	13	22.8%
31-45	57	21	36.8%
46-60	33	10	30.3%
≥60	52	11	21.2%
Total	300	68	22.7%

Table (2): The rate of *L.pneumophila* positive case s in relation to the clinical symptoms and signs

Clinical symptoms	Total examined	WNF IgG +ve	
		Frequency	Percentage %
Cough	287	64	22.3%
Breathlessness	162	42	25.9%
Chest pain	84	21	25%
Fever	201	42	20.9%
Haemoptysis	11	4	36.4%
Abdominal disorder	48	14	29.2%
Diarrhea	19	5	26.3%
Headache	26	5	19.2%
Sweating	8	2	25%
Running nose	16	7	43.8%
Fatigue	11	3	27.3%

Discussion

In this study, the seroprevalence of *L.pneumophila* was found to be (68) (22.7%) which is to some extent in agreement with the percentage obtained by Sabah and his co-workers (27.4%) (Sabah, *et al* 2010) and Bahl (21%) (Bahl, *et al* 1997). Lower seroprevalences of *L.pneumophila* among community acquired pneumonia were reported by Chaudhry (15%) (Chaudhry, *et al* 2000) and, Bahl and his team (9%) (Bahl, *et al* 1997).

Although Aggarwal (Aggarwal, *et al* 1997) reported a very high rate of *L. pneumophila* in the environmental specimens (76%) compared to 6.8% as reported by Mohamed (Mustafa, *et al* 2013) from Sudan but the rate of community acquired pneumonia caused by *L.pneumophila* obtained in the current study was far higher than what was reported by Aggarwal (Aggarwal, *et al* 1997). This could be because of the small sample size in Aggarwal (Aggarwal, *et al* 1997) study compared to our study (45) versus (300) respectively.

Conclusion

Among patient attending major hospitals in Khartoum state with pneumonia and chest infection the seroprevalence of *L.pneumophila* IgG antibodies was found to be (68) (22.7%). This study confirmed that the legionella may be an important water pathogen and important causes of community acquired pneumonia and atypical pneumonia. There is no specific symptoms and signs to distinguished Legionnaires' disease from other pneumonia. Therefore further in depth studies are recommended to explore the problem as this will help in designation appropriate preventive measures.

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