

Chlamydia pneumoniae seroprevalence in immunocompetent and immunocompromised populations in Milan

F Blasi, R Cosentini, M Clerici Schoeller, A Lupo, L Allegra

Abstract

Background—*Chlamydia pneumoniae* is drawing increasing attention as an agent of respiratory tract infection. Specific antibody prevalence in western countries is low in preschool children and reaches more than 50% in adults. However, little is known about the prevalence of this infection in immunocompromised subjects such as HIV-I infected patients. The aim of this study was to evaluate the seroprevalence of *Chl pneumoniae* in immunocompetent and immunocompromised (HIV-I infected) paediatric and adult populations.

Methods—Between March 1991 and September 1992 764 healthy subjects (421 men and 343 women, age range six months–81 years), 96 HIV-I infected (73 men and 23 women, age range 18–35 years) and 126 HIV-I negative intravenous drug users (92 men and 34 women, age range 18–37 years), and 50 children (23 boys and 27 girls, age range 8–123 months) with vertically transmitted HIV-I infection were studied. For each subject an HIV-I test (ELISA and Western blot) was performed, together with a microimmunofluorescence test for IgG and IgM antibodies to *Chl pneumoniae* specific antigen (TW-183).

Results—In the healthy population a low prevalence (11%) was observed in children under 10 years of age, which increased progressively to 58% in adults over 70 years. In the HIV-I infected population *Chl pneumoniae* seroprevalence was higher than in immunocompetent controls (children, 26% *v* 11%; drug users, 60% *v* 40%). Moreover, in drug users this difference was also observed in comparison with HIV-I negative intravenous drug users (60% *v* 33%).

Conclusions—Our data on *Chl pneumoniae* seroprevalence in a healthy population are consistent with those reported by others in western countries. Moreover, HIV-I infected subjects seem to be at higher risk of developing *Chl pneumoniae* infections.

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Chlamydia pneumoniae is a recently recog-

nised cause of respiratory tract infections.^{1,2} It has been classified as a third species of the *Chlamydia* genus by means of ultrastructural and DNA homology analysis.³ It is an obligate intracellular, Gram negative bacterium involved in a wide spectrum of respiratory tract infections; in fact, this agent can cause both upper respiratory tract infection (pharyngitis, sinusitis, and otitis) and low respiratory tract infection (acute bronchitis, exacerbations of chronic bronchitis, and community acquired and nosocomial pneumonias).^{4–6} Several studies have recently stressed its importance in the development of respiratory disease, showing a high incidence and prevalence of infections worldwide.

Specific antibody prevalence in western countries is low in preschool children and reaches more than 50% in adults, remaining high in old age because of *Chl pneumoniae* reinfection among adults.⁷ Little is known, however, about the prevalence of this infection in immunocompromised subjects such as HIV-I infected patients. Two recent papers reported evidence of *Chl pneumoniae* infection in HIV-I patients with pulmonary disease.^{8,9}

The aim of the present study was to evaluate *Chl pneumoniae* seroprevalence in immunocompetent and immunocompromised (HIV-I infected) paediatric and adult populations in Milan.

Methods

Serum samples were obtained from 764 (421 men and 343 women, age range six months–81 years) asymptomatic blood donors, subjects participating in a programme for atherosclerosis primary prevention, and children screened for hepatitis B infection. Serum samples were also obtained from a large group of intravenous drug users, 96 of whom were asymptomatic but HIV-I positive (73 men, age range 18–35 years, mean (SD) 29.1 (5.2)), and 126 who were HIV-I negative (92 men, age range 18–37 years, mean (SD) 29.6 (5.8)). We also studied 50 children (23 boys, age range 8–123 months, mean (SD) 48 (10)) with vertically transmitted HIV-I infection.

All serum samples were obtained between March 1991 and September 1992. Informed consent to participate in the study was obtained from all subjects (parents for children).

Institute of
Respiratory Diseases
F Blasi
R Cosentini
L Allegra

Pediatric Clinic
M Clerici Schoeller

Institute of Infectious
Diseases
A Lupo

University of Milan,
Italy

Reprint requests to:
Dott. Francesco Blasi,
Istituto di Tisiologia e
Malattie dell'Apparato
Respiratorio, Università
degli Studi di Milano, Pad.
Litta Ospedale Maggiore di
Milano, via F. Sforza 35,
1-20122 Milano, Italy

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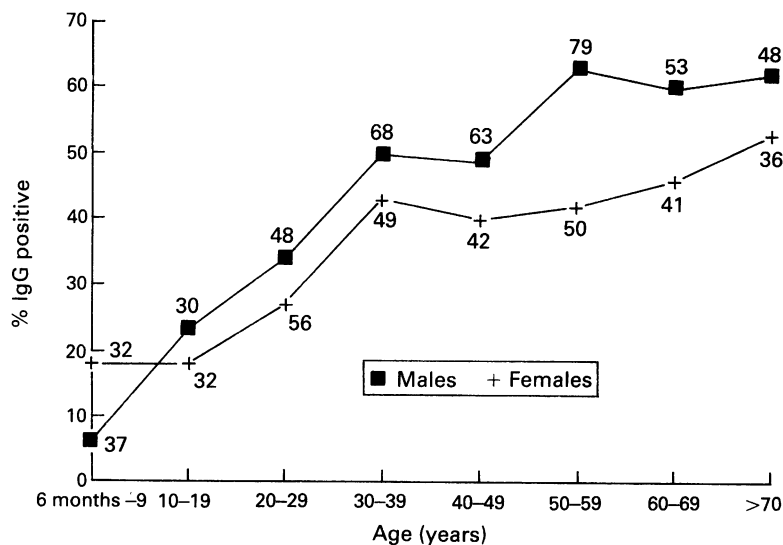
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Percentage of positive results in serological tests for IgG to *Chlamydia pneumoniae* in healthy subjects according to age and sex. Numerical values indicate numbers of subjects.

The study was approved by the ethical committee of the University of Milan. We performed an HIV-I test (ELISA and Western blot) together with a microimmunofluorescence test¹⁰ for IgG and IgM antibodies to *Chl pneumoniae* specific antigen (TW-183) prepared by the Washington Research Foundation, Seattle, USA, on each subject. Microimmunofluorescence results were classified as previously reported²: threshold titre positivity for IgM and IgG were >1:16 and >1:64, respectively.

STATISTICAL METHODS

Comparison of seroprevalence of *Chl pneumoniae* was performed with Fisher's exact test or χ^2 test.

Results

The seroprevalence of *Chl pneumoniae* in the healthy population is shown in the figure. There was a low prevalence (11%) in normal children under 10 years of age which increased progressively to 58% in adults over 70 years. Males showed a higher prevalence at all ages with the exception of children under 10 years (-12%). The greatest difference (+21%) was observed in subjects between 50 and 59 years. The seroprevalence of *Chl pneumoniae* in the HIV-I infected intra-

Table 1 Demographic characteristics and serological data in HIV-I positive and HIV-I negative intravenous drug users and in control subjects matched for age and sex

	Intravenous drug users		
	HIV-I positive (96)	HIV-I negative (126)	Controls (147)
M/F	73/23	92/34	95/52
Mean age (years)	29.1	29.6	28.5
Age range (years)	18-35	18-37	18-34
IgG \geq 1:64	58 (60%)*	41 (33%)	59 (40%)
IgM \geq 1:16	4 (4%)	0	0

*p < 0.01 *Chlamydia pneumoniae* seroprevalence in HIV-I positive v HIV-I negative intravenous drug users v controls (χ^2 test).

Table 2 Demographic characteristics and serological data of HIV-I vertically infected children and control subjects matched for age and sex

	HIV-I positive (50)	Controls (87)
M/F	23/27	42/45
Age range (months)	8-123	6-120
IgG \geq 1:64	13 (26%)*	9 (11%)
IgM \geq 1:16	2 (4%)	0

*p < 0.05 *Chlamydia pneumoniae* seroprevalence in HIV-I positive children v controls (Fisher's exact test).

venous drug users was significantly higher (p < 0.01, χ^2 test) than both HIV-I negative intravenous drug users and immunocompetent subjects matched for age and sex (table 1). Four (4%) HIV-I positive intravenous drug users had an IgM titre > 1:16, suggesting acute infection. Children with vertically infected HIV-I had a significantly higher prevalence (p < 0.05, Fisher's exact test) than healthy controls matched for age and sex (table 2). Two (4%) HIV-I positive children also had an IgM titre > 1:16, suggesting acute infection.

Discussion

Chlamydia pneumoniae is an emerging respiratory pathogen worldwide, causing more than 10% of community acquired pneumonias with a high seroprevalence in the adult population.⁷ Moreover, a possible role for this agent in low respiratory tract infections in immunocompromised patients has been suggested.^{8,9} To our knowledge, no data on seroprevalence in HIV-I infected subjects have been reported in the literature and the epidemiology of *Chl pneumoniae* in Italy is unknown.

We therefore studied *Chl pneumoniae* seroprevalence in a sample of the population of Milan, and in two groups of immunocompromised subjects represented by HIV-I infected drug users and HIV-I vertically infected children.

The microimmunofluorescence serological test used in this study, although quite time consuming, is a specific and sensitive diagnostic method for *Chl pneumoniae* infection. Thom *et al*⁴ reported that isolation of *Chl pneumoniae* without serological evidence of acute infection is rare and occurred in only 4/1100 of their patients. Grayston¹¹ in a large study involving more than 6000 subjects confirmed that non-specific cross reactions in the microimmunofluorescence test between *Chl trachomatis* and *Chl pneumoniae* do not occur when the test is interpreted properly for specific reactions.

Our data on population seroprevalence in the healthy population are consistent with those reported by Grayston *et al*⁷ and show that infection is endemic in the general adult population in our area, with a similar pattern to that in other western countries. *Chl pneumoniae* seroprevalence in HIV-I infected subjects was significantly higher than in healthy subjects for both HIV-I vertically infected

children and HIV-I infected intravenous drug users. Interestingly, in the latter group seroprevalence was also significantly higher when compared with a group of HIV-I negative intravenous drug users, suggesting that the risk factor for *Chl pneumoniae* infection is immunodeficiency rather than life style.

The high seroprevalence of *Chl pneumoniae* in HIV-I infected subjects, and the casual finding of antibody titre suggesting acute infection, together with the recent reports of clinical *Chl pneumoniae* infections in immunocompromised subjects^{8,9} confirm the potential role for this agent in the pathogenesis of respiratory tract infections in HIV-I infected subjects.

Further studies are needed to elucidate fully the pathogenetic role of *Chl pneumoniae* in HIV-I infected subjects, because this high antibody prevalence could be the result of either a greater rate of infection in immunocompromised subjects or a polyclonal immunoglobulin activation commonly found in HIV patients.

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