

## Incidence of *Chlamydia trachomatis* in the Population of the City of Queimados, Province of Rio de Janeiro, Brazil

Luciana de Araújo Marciano Guerra<sup>1</sup>, Fabiano Lacerda Carvalho<sup>2</sup>, Antonio Neres Norberg<sup>1,3,4\*</sup>, Fabiano Guerra Sanches<sup>5</sup>, Aluizio Antonio de Santa Helena<sup>1</sup>, José Tadeu Madeira de Oliveira<sup>1,6</sup>, Paulo Roberto Blanco Moreira Norberg<sup>4</sup>

<sup>1</sup>UNIABEU University Center, Rio de Janeiro, Brazil

<sup>2</sup>Iguaçu University – UNIG, Cancer National Institute – INCA, Rio de Janeiro, Brazil

<sup>3</sup>Souza Marques Medicine School – FTESM, Brazil

<sup>4</sup>São Carlos Metropolitan School – FAMESC, Rio de Janeiro, Brazil

<sup>5</sup>Army Central Hospital – HCE, Rio de Janeiro, Brazil

<sup>6</sup>Benjamin Constante Institute - IBC, Rio de Janeiro, Brazil

### \*Corresponding author

Antonio Neres Norberg

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**Abstract:** *Chlamydia trachomatis* is a bacterium that can only replicate in human cells and is recognized as an infectious agent of sexual and perinatal transmission. The objective of this research is to Investigate antibodies of the IgM and IgG classes against *C. trachomatis* in the serum of patients of both genders with clinical suspicion of *Chlamydia* infection in the population of the city of Queimados, Baixada Fluminense region, Province of Rio de Janeiro, Brazil. Antibody detection was performed in the serum of 55 patients of both genders. The kits used for diagnostics were: *Chlamydia trachomatis* IgG ELISA antigen purified reactive MOMP antigen, serotype K for IgG and *C. trachomatis* kit (IgM) ELISA method for IgM. Total incidence rate was determined in 51%, being more frequent among women. There was no significant association between *C. trachomatis* infection and the age of the patients. It is recommended to perform routine tests for the laboratory diagnosis of this pathogen in order to avoid the evolution to more worrying health conditions.

**Keywords:** *Chlamydia trachomatis*, cervicitis, vaginitis, vulvovaginitis, urethritis.

### INTRODUCTION

*Chlamydia trachomatis* is a bacterium that can only replicate in human cells which can affect the genitourinary tract, liver, lungs, joints, pharynx and ocular conjunctiva in both genders. It is estimated that between 60% and 90% of the infected women stay as asymptomatic carriers, but when untreated the infection affects mostly in the cervix, and can cause chronic pelvic inflammatory disease, ectopic pregnancy and infertility.

The infection may also be transmitted to the newborn at the birth [1-3]. Infections caused by *C. trachomatis* are increasingly diagnosed and prevalent in patients of both genders [2]. The sexual act is the most frequent mechanism of transmission of the etiologic agent of the chlamydiosis.

This pathogen is a bacterium with worldwide distribution and is known since ancient times. References to diseases caused by *C. trachomatis* were found in Egyptian papyrus and also in Chinese antique literature. The pathogenesis and the blindness as a complication have been recorded since the twentieth century b.C. In Europe, the disease was already known in the Middle Age. At the Napoleonic wars, it became highly prevalent among civilians and military, causing blindness in a large number of people as a consequence of the *Chlamydia* infection [1]. This disease has been described since ancient times, but it is

difficult to determine how much sexual promiscuity, prostitution or unsatisfactory hygiene habits have contributed to its spread. Prostitution, for example, has much of its stigma linked to the diseases associated with it [4]. It is estimated that among people infected with *C. trachomatis* 50% of men and 70% of women are asymptomatic carriers, which facilitates the spread and maintain a large population as a reservoir of bacteria. Currently, the spread of sexually transmitted infections has become increasingly important. It is estimated that around 250 million new cases of sexually transmitted diseases occur each year [2].

Considering *C. trachomatis* as an important pathogen and the unknown status of its incidence in the region, the objective of this research was to investigate antibodies of the IgM and IgG classes against *C. trachomatis* in the serum of patients of both genders with clinical suspicion of *Chlamydia* infection in the

population of the city of Queimados, Baixada Fluminense region, Province of Rio de Janeiro, Brazil.

**MATERIALS AND METHODS**

This research has an individual, observational and transversal design. The sample consisted of sexually active men and women aged from 18 to 67 years who presented suggestive clinical signs of *Chlamydia* infection. The research was conducted between January 2015 and December 2017 among patients attending clinics in the city of Queimados, Province of Rio de Janeiro, Brazil. The investigation of IgG class antibodies was performed using the kit *Chlamydia trachomatis* IgG ELISA antigen: purified reactive MOMP antigen, serotype K. This kit is

indicated for *in vitro* semi- quantitative assay or quantitative assay of human IgG class antibodies against *C. trachomatis* in serum or plasma samples. The *C. trachomatis* kit (IgM) ELISA method is indicated for the *in vitro*, semi-quantitative and quantitative assay of human IgM class antibodies against *C. trachomatis*. These kits were used to investigate antibodies of the IgG and IgM class of the 55 serum samples from patients of both genders.

**RESULTS**

The *Chlamydia trachomatis* incidence investigation was performed with 55 patients, 38 women and 17 men. Patient’s ages ranged between 18 and 67 years (Table-1).

**Table-1: Serology of patients by age group and gender**

Age class	Patients			Positive (IgG ou IgM)			
	F	M	Total	F	M	Total	%
18-27	9	6	15	6	3	9	60%
28-37	21	7	28	13	0	13	46%
38-47	7	4	11	3	3	6	55%
58-67	1	0	1	0	0	0	0%
Total	38	17	55	22	6	28	51%

**Table-2: Serology results for IgM class antibodies according to the patient gender**

IgM results	Women		Men		Total	
	n	%	n	%	n	%
Reagent	8	21%	3	18%	11	20%
Not reagent	30	79%	14	82%	44	80%
Total	38	-	17	-	55	-

**Table-3: Positive serology for IgM class antibodies incidences according to the patient gender and age class**

Positive results for IgM	Women		Men		Total	
	n	%	n	%	n	%
18-27	2	25%	1	33%	3	27%
28-37	6	75%	0	0%	6	55%
38-47	0	0%	2	67%	2	18%
58-67	0	0%	0	0%	0	0%
Total	8	-	3	-	11	-

**Table-4: Serology results for IgG class antibodies according to the patient gender**

IgG results	Women		Men		Total	
	n	%	n	%	n	%
Reagent	17	45%	3	18%	20	36%
Not reagent	21	55%	14	82%	35	64%
Total	38	-	17	-	55	-

**Table-5: Positive serology for IgG class antibodies incidence according to the patient gender and age class**

Positive results for IgG	Women		Men		Total	
	n	%	n	%	n	%
18-27	5	29%	1	33%	6	55%
28-37	9	53%	0	0%	9	82%
38-47	3	18%	2	67%	5	45%
58-67	0	0%	0	0%	0	0%
Total	17	-	3	-	20	-

*C. trachomatis* was more incident among women (58% against 35% of men). Five patients – all of them women - presented positivity both to IgM and IgG. The total incidence rate was determined in 51%. There was no significant association between *C. trachomatis* infection and the age of the patients.

## DISCUSSION

The research was driven by the lack of records in the literature indicating the incidence of genital infections by *Chlamydia trachomatis* in the population of the city of Queimados, Province of Rio de Janeiro, Brazil. These microorganisms are usually transmitted through sexual intercourse without adequate protection and can cause diseases that evolves to complications and consequently induce important sequelae [5, 6].

Aguiar *et al.*, affirmed that *C. trachomatis* infection is the most common sexually transmitted bacterial infection, with more than 100 million adults infected each year. This infection in the acute phase can cause cervicitis, urethritis, genital ulcers or may remain asymptomatic, as occurs in most cases. However, pregnant women infected with this bacterium are at risk for miscarriage, premature birth or giving birth to a low weight child. As a consequence of maternal infection, neonates born from infected mothers have the risk of developing pneumonia and neonatal conjunctivitis. As the infection evolves, women's reproductive capacity can be seriously affected with pelvic inflammatory disease, ectopic gestation, infertility and may still transmit the infection to the newborn at birth [7].

Genital infections by *C. trachomatis* have become one of the most commonly reported bacterial diseases in several countries in recent years, and most reports show that young people, especially women, are at high risk of being infected [8]. In Paris, the disease was diagnosed among 22% of adolescent women, 17% of women of all ages attended in sexually transmitted diseases clinics, and 2% of pregnant women attended by obstetricians in prenatal clinics [2]. In Italy, among 2071 women with cervicitis, 5% of cases were caused by *C. trachomatis* [1]. In Greece, among 400 sexually active and asymptomatic women, the infection occurred in 4% of the examined women, and in the Province of Virginia, United States of America, the infection was diagnosed in 8.1% among 479 sexually active college students [2]. In Chile, *C. trachomatis* was found in the cervix of 19 women among 403 examined, resulting in a prevalence of 4.7% [9]. The prevalence registered for these countries are lower than those recorded in the city of Queimados, which was of 51%. In Brazil, the total prevalence of *C. trachomatis* infection in 2005 was estimated at 9.2% for both genders and 7.3% for women. The overall rates for some cities were: Rio de

Janeiro 15%, Porto Alegre 13.8%, São Paulo 9.1%, Manaus 7.8%, Goiânia 7.6% and Fortaleza 4.7% [2].

Smelov *et al.*, conducted a study on the health data of 1263 patients in the city of St. Petersburg, Russia. Samples were collected from urethral, anal, cervical and prostate regions. The results showed that *C. trachomatis* genital infections varied between 2.9% and 33% according to the studied population [10].

Xue *et al.*, investigated the prevalence of *C. trachomatis* among men who attended to sexually transmitted diseases clinics in the province of Guangdong, China. The collected material was submitted to the PCR method. Among 1903 samples, 163 (8.6%) were positive for *C. trachomatis*. The group aged from 21 to 30 years had a higher prevalence, rated at 10.5% [11].

The prevalence of infection by *C. trachomatis* among women in reproductive age in a hospital in northern Nigeria was investigated by Ige *et al.*, A total of 365 women had endocervical samples collected. The material was sent to DNA extraction and the Polymerase Chain Reaction (PCR) was performed using primers supplied by Biotechnical Industries of South Africa. The result showed that among the 365 women, 95 of them were positive according to PCR results, a 26% of prevalence for genital infection by *C. trachomatis* among women in reproductive age. The authors indicate that among the participants, low schooling, early sexual initiation and early marriages were observed and almost all participants did not use protection during the sexual act. The frequency of positivity was higher in the age group of women between 25 and 29 years, many of them single [12].

A research on *C. trachomatis* infection was performed by Learner *et al.* among young people who were selected for the US National Job Training Program between 1990 and 2012. The results of the examinations of 389.555 women and 303.699 men were evaluated. The prevalence of *C. trachomatis* infections was high in the period and showed a downward trend, with a 20% prevalence in 1990, lowering to 12% in 2003, and estimated between 12% and 14% in the year of 2012. The prevalence in the male gender presented stability, with an average of 7% throughout the research period. Population groups with the highest prevalence values were African-Americans, Amerindians, and the younger population [13]. According to the literature, there are indications that *C. trachomatis* is one of the most frequent agents causing sexually transmitted diseases in the United States. In 2003, 887.478 cases of urogenital infections were reported, but this number is believed to be underestimated because the majority of

infected people did not search for medical treatment or are treated without a specific diagnosis. Assessments suggest that every year 2.8 million Americans are infected and around 50 million new cases occurs worldwide [1, 14].

According to Medic *et al.*, the prevalence of genital infections caused by *C. trachomatis* differs according to the studied population. These investigators assisted 1210 patients in the city of Puebla, Mexico, which 127 (10.49%) had cervicovaginitis, and among them, 6 (4.72%) were diagnosed as cervicitis by *C. trachomatis*. The registered prevalence was 0.49%, and the average age was 28 years. We agree the ideas of these authors, who considered that sexually transmitted infections have a wide incidence and constant diffusion throughout the world as a consequence of promiscuous sexual behaviour, multiple partners, unprotected relationships and poor personal hygiene habits. These facts generate social and public health problems, especially in communities with low socioeconomic levels, where disease control is hard due to the poor education of the population, worsened by poor hygiene conditions and difficult access to health services. Another situation that increases the problem is related to the high percentage of patients with asymptomatic infections due to sexually transmitted pathogens; in these cases, promiscuous sexual practice causes an increase in the number of people infected. We believe that a similar situation occurs in the population of the city of Queimados, a place with low socioeconomic levels, where the results of our research registered positivity for 51% of the patients with suggestive clinical signs of *Chlamydia* infection [15].

López- Hurtado *et al.*, investigated the prevalence of genital infection by *C. trachomatis* in women attended at the National Institute of Perinatology in the Mexico City. These researchers analyzed 2532 endocervical samples and submitted to polymerase chain reaction (PCR). Among the tested samples, 102 (4.3%) were positive for *Chlamydia* antigens [16].

The prevalence and the phylogenetic analysis of *C. trachomatis* in a population of women from the city of Posadas, Province of Misiones, Argentina, was researched by Jordá *et al.*, These authors analyzed 505 endocervical samples from symptomatic and asymptomatic women, and detected 43 positive samples for *C. trachomatis*, with a prevalence of 8.5% (95% confidence level ranging from 6.4% to 11.3 %). The prevalence found for this bacterium was higher in women with vaginal symptoms (11.3%, as compared to 5.4% in the asymptomatic ones), as well as in women with less than 26 years (11.5%). From the phylogenetic analyzes, the authors observed that 62% of the samples positive for the gene *OmpA* belonged to the E

genotype, 15% to genotype J, 15% to genotype D and 8% to genotype F. The authors concluded that the research was the first contribution on molecular epidemiology of *C. trachomatis* in the Province of Misiones, Argentina, which shows the prevalence rate of this bacterium and provides information about the circulating genotypes in the studied area [3].

*C. trachomatis* infection in patients in Colombia was studied by Arias- Cardona *et al.*, They examined 1660 patients of both genders in Bogota and 1087 in Medellin. Diagnosis was made by serology to detect antibodies of the IgM and IgG classes anti-*C. trachomatis*. The positive frequency for IgG was 15.6% in patients from Bogotá and 16.9% in Medellin. The presence of IgM was 0% in Medellin and 0.2% in Bogota [17]. Our results with 55 people of both genders showed 51% positivity in the city of Queimados, being 20% reactive for IgM and 36% for IgG, higher than the results found in Colombia.

The group of Brazilian researchers Santos *et al.*, described the prevalence and associated factors to endocervical *C. trachomatis* infection in college students in the Province of Pará, Brazil. They investigated women in the Province capital and of three campus located in other cities in the interior of the Province. The research had a cross-sectional design with students aged 18 years and over submitted to cervical cancer screening. DNA from the cervicovaginal secretion was extracted and subjected to the polymerase chain reaction (PCR). The prevalence of *C. trachomatis* was 11.9%. The infection was diagnosed in 10.4% of the students in the capital and 16.5% of students in the cities of the interior of Pará. The authors concluded that the prevalence of *C. trachomatis* infection among university students is similar to the average found in Brazil and it was not associated to the sociodemographic or behavioral conditions of the university students [18].

Eleutério *et al.*, investigated the prevalence of *C. trachomatis* infection among women attending private clinics in the city of Fortaleza, Brazil. The vaginal material collected in the years of 2014 and 2015 was subjected to the hybrid capture method for the detection of the pathogen. The prevalences found were 11.22% for the year 2014 and 8.24% for the year 2015. The authors emphasized that the highest prevalence was observed in women in the age group around 40 years and considered that the prevalence of *C. trachomatis* is high when compared to the other regions [19].

Genital infections in women attended at a Basic Health Unit in the city of Vitória, Province of Espírito Santo, Brazil, were investigated by Barcelos *et al.*, Genital specimens from 299 women were collected to investigate microbial agents causing genital infection. They also collected urine samples for the

molecular biology test to screen *C. trachomatis* antigens. The result showed positivity for *Chlamydia* antigens with a 7.4% rate [20].

Norberg *et al.*, studied the incidence of cervical infection by *C. trachomatis* among indigenous women of the Terena ethnic group of the Moreira community in the city of Miranda, Mato Grosso do Sul, Brazil. Twenty-five women who presented gynecological problems participated in the research. The collected material from the endocervical region was submitted to the direct immunofluorescence test. The results showed 4 positive samples, corresponding to 16% of the 25 examined samples. The authors concluded that *C. trachomatis* was one of the etiological agents of endocervical infection and admitted that the results of the studied population are within the average of positivity found in similar populations [21].

### CONCLUSIONS

There is an expressive incidence of infection in both genders among patients with suggestive clinical signs of *Chlamydia* infection, with a higher incidence among women. The results did not show a significant association between *C. trachomatis* infection and the age of the patients. It is recommended to perform routine examinations for the laboratory diagnosis of this pathogen among sexually active people, which has non-specific symptoms, and is a source of few clinic histories among patients. Untreated the infection can cause prostatitis and infertility in men and chronic pelvic inflammatory disease, ectopic pregnancy and infertility in women, being also a risk to the conceptus.

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