

# Seroprevalence of *Chlamydia trachomatis* Infection in Women of Procreate Age in the Mayo-Boneye Department in Chad

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**How to cite this paper:** Ossoga, G.W., Antipas, B.-B.B., Ngayam, H., Hagassou, L. and Issakou, B.-V. (2023) Seroprevalence of *Chlamydia trachomatis* Infection in Women of Procreate Age in the Mayo-Boneye Department in Chad. *Open Journal of Medical Microbiology*, 13, 251-262.

<https://doi.org/10.4236/ojmm.2023.134020>

**Received:** August 11, 2023

**Accepted:** December 17, 2023

**Published:** December 20, 2023

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## Abstract

**Introduction:** *Chlamydia trachomatis* infections constitute a major public health problem, particularly in women. The objective of this study is to identify *Chlamydia trachomatis* to improve the health of women in the Department of Mayo-Boneye. **Methodology:** This is a prospective observational study that took place from October to December 2021, including 168 patients with their sociodemographic characteristics. The venous blood of the patients was collected in dry tubes and centrifuged to obtain the serum. The Chlamydia IgG Rapid Test Cassette was used for the detection of antibodies to Chlamydia infection. The Epi Info 7™ software was used to perform the statistical analyses. **Results:** A total of 168 patients were included in this study. The average age was  $26.36 \pm 9.21$  years, the median was 25.5 years with the extremes of 14 years and 70 years. Among these patients, 46.43% were illiterate, 5.95% and 20.83% were primary and secondary school students, respectively, and 26.79% university students. For marital status, 66.67% were single, 16.67% married, 10.71% divorced and 5.95% widowed. Regarding the profession, 26.79% were traders, 8.93% were employees and 64.29% unemployed. In this study, the 168 patients had performed *Chlamydia trachomatis* serology among whom 02 (1.19%) were excluded for invalid results and 10.71% presented positive cases. The city of Bongor was the most infected with 61% of cases. Among these patients, 54.22% were linked to risk factors for *Chlamydia trachomatis*. The most infected age group was between 25 and 35 with a seroprevalence of 5.36% of cases. **Conclusion:** In this study, *Chlamydia trachomatis* was positive for 10.71% of diagnosed cases. The most affected age

groups are young, sexually active women. The State should emphasize the screening of women, the awareness of students and academics.

## Keywords

Seroprevalence, *Chlamydia trachomatis*, Women, Chad

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## 1. Introduction

*Chlamydia trachomatis* infections are cosmopolitan. These infections have been recognized as a major public health problem because of the complications they cause, particularly in women, such as tubal sterility and ectopic pregnancy. Today, they are at the forefront of sexually transmitted infections (STIs). The pauci-symptomatic character of the uro-genital infection with *Chlamydia trachomatis* is at the origin of the dissemination and the complications observed in young women such as salpingitis, ectopic pregnancies (EUP) and tubal infertility [1]. *Chlamydia trachomatis* is the leading cause of communicable infections and public health problem worldwide [1] [2]. It is an obligate intracellular Gram-negative bacterium that infects the columnar epithelium of the cervix of women [3] [4].

*Chlamydia trachomatis* is the most common sexually transmitted bacterial infection worldwide, with approximately 4 - 5 million of new cases each year [5]. The World Health Organization (WHO) estimated that 50 million women were newly infected worldwide, including 34 million in sub-Saharan Africa and Southeast Asia [2].

Undetected and untreated Chlamydia infection can ascend the upper genitalia which can cause pelvic inflammation, infertility, ectopic pregnancy and chronic pelvic pain [6] [7]. The different clinical manifestations of Chlamydia infection in women and associated diseases such as: cervicitis, endometritis, salpingitis, pelvic inflammatory disease, infertility, perihepatitis, show that most women who suffer from them do not receive medical care, because more than three quarters of them are usually asymptomatic [8].

In developing countries, particularly those in Sub-Saharan Africa, data on this infection are rare given the limited and often unavailable diagnostic means [9]. In nearly 80% of women and 50% of men, *Chlamydia trachomatis* infection remains asymptomatic [10].

In Chad, data concerning *Chlamydia trachomatis* are rare. This research work aims to identify *Chlamydia trachomatis* responsible for uro-genital infections in order to improve the health of women in the Department of Mayo-Boneye.

## 2. Material and Methods

### 2.1. Ethics Approval

This research work was carried out thanks to the authorization under the refer-

ence N°090/PCMT/PM/MSPSN/SE/SG/DPSSN-MKE/HPB/2022 from the General Directorate of the Provincial Hospital of Bongor. All precautions aimed at respecting the anonymity and confidentiality of patient information were rigorously respected.

## 2.2. Study Framework

This study was carried out at the provincial hospital of Bongor mainly in the Maternity Department and that of the Medical Analysis Laboratory.

## 2.3. Type and Period of Study

It is a prospective observational study that took place from October to December 2021.

## 2.4. Study Population

The study population included 168 patients. It was made up of all the patients attending the Maternity Service during this study period.

## 2.5. Inclusion and Non-Inclusion Criteria

All women of procreate age with clinical manifestations of *Chlamydia trachomatis* infection and consenting were included in the study. On the other hand, those who were not of procreate age and those with other diseases were not taken into account.

## 2.6. Sampling

The sampled population was recruited using questionnaires that were made available to them for the purpose of defining socio-demographic characteristics and clinical signs, see the survey sheet.

## 2.7. Samples Treatment

### 2.7.1. Blood Sample

The venous sampling consisted of using a syringe, a dry tube, a socket, a tourniquet, alcohol at 70°C and sterile cotton. The sample was taken from the bend of the elbow in a dry tube.

### 2.7.2. Obtaining Serum

Serum is obtained by centrifugation of the sample at 2000 rpm for 5 minutes to separate plasma from whole blood.

### 2.7.3. Identification of *Chlamydia Trachomatis*

We used the Chlamydia IgG Rapid Test Cassette which is a rapid test allowing the detection of specific antibodies circulating in human blood during a Chlamydia infection. It is a test based on the antibody-antigen reaction [11].

## 2.8. Statistical Analyzes

The databases were entered in the Microsoft Excel 2007 software and transferred

to the Epi Info 7™ software which made it possible to carry out the statistical analyses. Descriptive and analytical statistical analyzes were performed according to a specific analysis plan. For quantitative variables, the mean and the standard deviation were calculated. All statistical tests and analyzes were performed using a 95% confidence level. The results were presented in the form of tables and figures.

### 3. Results

#### 3.1. Sociodemographic Characteristics of Patients

A total of 168 patients were included in this study. The average age of the patients, the median with the extremes are represented in **Table 1**.

**Table 1.** Distribution of patients according to socio-demographic characteristics.

Features	N = 168	%	[IC 95%]
<b>Age (years)</b>			
Mean ( $\pm$ SD)	26.36 $\pm$ 9.21 ans		
Median	25.5 ans		
Extremes	14 - 70 ans		
<b>Age range (years)</b>			
14 - 24	83	49.40	[41.62 - 57.21]
25 - 35	61	36.31	[29.04 - 44.07]
36 - 46	20	11.90	[7.43 - 17.79]
47 - 57	2	1.19	[0.14 - 4.23]
58 - 68	1	0.60	[0.02 - 3.27]
>68	1	0.60	[0.02 - 3.27]
<b>Level of education</b>			
Unschooling	78	46.43	[38.71 - 54.27]
Primary	10	5.95	[2.89 - 10.67]
Secondary	35	20.83	[14.96 - 27.76]
University	45	26.79	[20.26 - 34.15]
<b>Marital status</b>			
Bachelor	112	66.67	[58.99 - 73.74]
Married	28	16.67	[11.37 - 23.18]
Divorce	18	10.71	[6.47 - 16.40]
Widow	10	5.95	[2.89 - 10.67]
<b>Occupation</b>			
Trader	45	26.79	[20.26 - 34.15]
Employee	15	8.93	[5.08 - 14.30]
Unemployed	108	64.29	[56.54 - 71.52]

N: Total number of patients; %: Percentage; SD: Standard Deviation; 95% CI: 95 percent confidence interval.

The highest age group is that of 14 - 24 years with 49.40% of patients. For the level of education, the illiterate accounted for 46.43%. Regarding marital status, singles were more numerous with 66.67% of the workforce. For the profession, the unemployed constitute the majority with 64.29%. For details see **Table 1**.

### 3.2. Distribution of Suspected Chlamydia Patients in the Department of Mayo-Boneye

The majority of patients came from Bongor which is home to the Province of Mayo-Kebbi/East followed by Koumi. See **Table 2**.

### 3.3. Seroprevalence of *Chlamydia trachomatis* in Infected Patients

Of 168 patients included in this study, 02 (1.19%) were excluded for invalid results and 166 (98.86%) were retained. The 166 patients had carried out *Chlamydia trachomatis* serology of which 18 or 10.71% presented positive cases. For this purpose, the city of Bongor was the most infected, see details in **Figure 1**.

### 3.4. Seroprevalence of *Chlamydia trachomatis* by Age Group

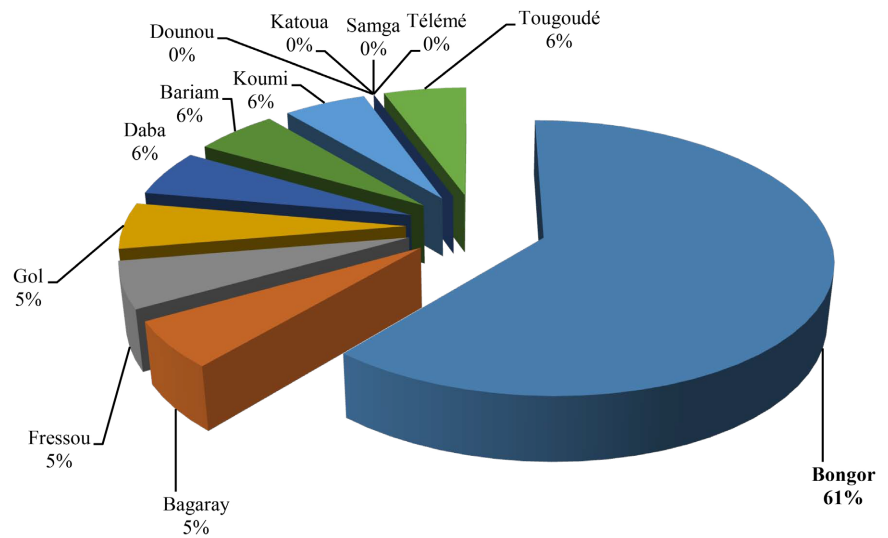
We have made the distribution of infected patients by age group. The age group most infected with *Chlamydia trachomatis* is between 25 - 35 with 5.36% of cases, see details in **Figure 2**.

### 3.5. Risk Factors for *Chlamydia trachomatis*

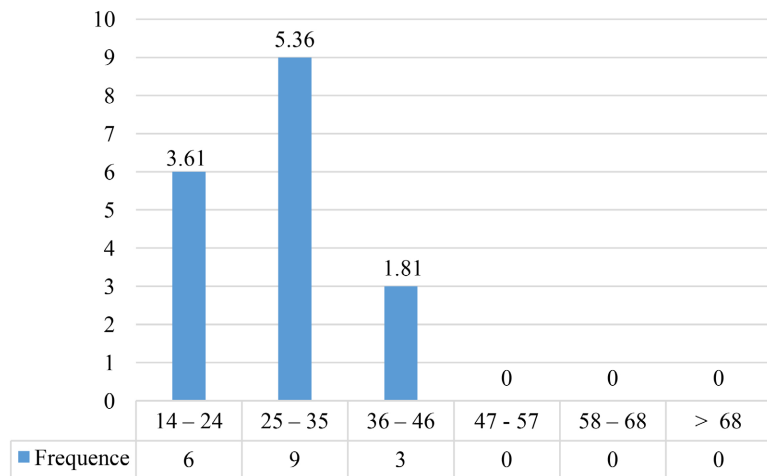
Using the recorded questionnaires, we identified factors associated with the likelihood of patients being infected with *Chlamydia trachomatis*. According to **Table 3**, the highest risk factor was early sexual intercourse linked to poverty with 35 patients or 38.89% followed by that of lack of education on STIs with 30 patients or a rate of 33.33%.

**Table 2.** Distribution of patients suspected of Chlamydia infection in the Department of Mayo-Boneye.

Department of Mayo-Boneye	N = 168	%	[IC 95%]
Bongor	156	93.98	[89.20 - 97.07]
Bagaray	1	0.60	[0.02 - 3.27]
Fressou	1	0.60	[0.02 - 3.27]
Gol	1	0.60	[0.02 - 3.27]
Daba	1	0.60	[0.02 - 3.27]
Bariam	1	0.60	[0.02 - 3.27]
Koumi	2	1.19	[0.14 - 4.23]
Dounou	1	0.60	[0.02 - 3.27]
Katoua	1	0.60	[0.02 - 3.27]
Samga	1	0.60	[0.02 - 3.27]
Téléme	1	0.60	[0.02 - 3.27]
Tougoudé	1	0.60	[0.02 - 3.27]



**Figure 1.** Distribution of patients suffering from *Chlamydia trachomatis*.



**Figure 2.** Distribution of patients infected with *Chlamydia trachomatis* by age group.

**Table 3.** Factors behind the risk of *Chlamydia trachomatis* infection in patients.

Risk factors	N = 90	%	[IC 95%]
Naivety of the young age of the patient	5	5.56	[1.83 - 12.49]
Early sex linked to poverty	35	38.89	[28.79 - 49.74]
Unprotected sex	4	4.44	[1.22 - 10.99]
Lack of education on sexually transmitted infections (STIs)	30	33.33	[23.74 - 44.05]
Lack of screening	16	17.78	[10.52 - 27.26]

## 4. Discussion

### 4.1. Limitations of the Study

This study had limitations because some women did not consent and it reduced

the number of our patients. The means did not allow us to carry out cell culture and the test based on the nucleic acid of *Chlamydia trachomatis*.

#### 4.2. Sociodemographic Characteristics

*Chlamydia trachomatis* infection is still current in Africa. Chad is not spared and more particularly the Department of Mayo-Boneye in the Province of Mayo-Kebbi/East. In this study, 168 patients were included with an average age of  $26.36 \pm 9.21$  years; the median was 25.5 years and the extremes from 14 to 70 years. A study carried out among women consulting in orthogenics in Mayotte gave results similar to ours, but their population was younger with extremes of 14 to 43 years, the median age of the population studied was 25 years and the average age was  $24.9 \text{ years} \pm 6.8$  [12]. The difference between our study and theirs is that our results obtained during this period of study were representative of the population of Mayo-Boneye, on the other hand, they only made a study in a Service on the very young personnel not representative of population with very limited age extremes.

Regarding the level of education, marital status and profession in our study, the uneducated, the single and the unemployed were the most represented with 46.43%, 66.67% and 64.29%, respectively. The study carried out by Apolline in Mayotte gave results almost similar to ours for the cases of single people and the unemployed [12]. Regarding the level of training, the unemployed in our study were more numerous, on the other hand in Mayotte, university students were more represented with a rate of 63%. The level of education on Reunion Island is higher than that of Chad and more particularly of Mayo-Boneye.

#### 4.3. Distribution of Suspected Chlamydia Patients in the Department of Mayo-Boneye

In our study, patients suspected of *Chlamydia trachomatis* infection identified through clinical diagnosis were distributed by village and town in the Department of Mayo-Boneye. If confirmed, this infection can manifest itself in women, with white discharge, dysuria, contact bleeding (haemorrhaging after vaginal intercourse) and metrorrhagia (blood loss between periods). In this distribution the city of Bongor had 93.98% of female suspects. A study carried out in Switzerland presented a rate similar to ours of 95%. Certainly many women will be screened positively and the consequences will be serious complications such as pelvic inflammatory disease, ectopic pregnancy and infertility [13].

#### 4.4. Seroprevalence of *Chlamydia trachomatis* in Infected Patients

*Chlamydia trachomatis* is the most common sexually transmitted bacterial infection in the world [14]. The seroprevalence of this infection was 10.71% in our study. A study carried out at the Nkoldongo District Hospital in Yaoundé reported a rate 22.52% higher than ours. According to the authors, this high rate can be justified by the young age of these adolescents who most often have unprotected sex and frequently change sexual partners [14]. Our result was some-

times lower and also higher than those reported in some studies carried out in Reunion Island, although in these studies the authors used more sensitive technique than ours (Polymerase Chain Reaction). The prevalences were 22.9% and 6.6% respectively [12] [15].

#### 4.5. Risk Factors for *Chlamydia trachomatis*

In our study, five potential risk factors were identified: the naivety of the young age of the patient, early sexual intercourse linked to poverty, unprotected sexual intercourse and lack of education on sexually transmitted infections and absence of screening.

For the naivety of the young age of the patient, it concerns only 5.56%. This is a current situation experienced by young girls who have sometimes escaped family education and are easily deceived by sexually mature young men. The same observation was made in a study carried out on Reunion Island with a prevalence of 5.6% [15].

Early sexual intercourse linked to poverty is a gangrene that undermines our current societies. Poverty pushes young girls in search of money and who become easy sexual prey with exposure to sexually transmitted infections (STIs). In our study 38.89% of patients recognized this behavior. Similar results with the same behaviors highlighted another study reporting 36.1% of cases [15].

Unprotected sex in our study was 4.44% and according to these women, they trusted their partners but after the interview they recognized the risk taking for some with negative *Chlamydia trachomatis* and others a regret for the positive cases. The study still carried out in Reunion Island presented prevalence clearly higher than ours, with 30.3% of women who have never used a condom. The absence of condom use is almost significantly associated with the risk of disease occurrence [15].

The lack of education on STIs was one of the highest prevalence cases in our country with 33.33% of young women. We have noticed that sexuality in our traditional societies, and especially in Africa, is a taboo subject. In a study carried out in two female high schools in Chad, yield very important results on the sexual education of young people in the school and family environment. These factors identified and recognized by young people are at four distinct levels, in particular: the lack of social communication around sexuality both at family and school level; the influence of socio-cultural practices on the sexual behavior of adolescents; the non-involvement of young people in dealing with problems related to their sexuality and finally, the slowness and lack of interest shown by schools in taking education into account [16].

Lack of screening can be the cause of increased contamination with *Chlamydia trachomatis* and complications related to infections. In our study, 17.78% of patients have never been screened. Another study conducted in Reunion Island noted the proportion of 46.1% of women who had never been screened for STIs during their life and which was significantly higher among women with positive *Chlamydia trachomatis* [15].



#### 4.6. Identification of *Chlamydia Trachomatis* by Age Group

*Chlamydia trachomatis* infection is the most common sexually transmitted infection (STIs) of bacterial etiology. It particularly affects young, sexually active subjects, thus constituting a real public health problem throughout the world [17]. During our study, we made the distribution of infected patients by age group. The age group most infected with *Chlamydia trachomatis* is that between 25 - 35 followed by that between 14 - 24 with respective seroprevalences of 5.36% and 3.61% of cases. We have found that the age groups most affected are young, sexually active women. On the other hand, a study conducted by Duval and his team showed higher results than ours and his population infected by *Chlamydia trachomatis* was even younger than ours. The distribution of their patients by age group showed that the age group with the highest prevalence of infection was that of 12 - 17 years with 14.3% of infections against 7.5% among 17 - 24 years. According to the authors, the lack of knowledge of underage patients in terms of sexuality and contraception encourages these risky behaviors [15].

#### 5. Conclusion

*Chlamydia trachomatis* infections are a major public health problem among women in the Department of Mayo-Boneye. Of the 168 patients who performed *Chlamydia trachomatis* serology, 10.71% presented positive cases. The city of Bongor was the most infected, with 61% of cases. The most infected age group was between 25 and 35 with a seroprevalence of 5.36% of cases. The most affected age groups are young, sexually active women, which has an influence on their sterility. The lack of knowledge of underage patients in terms of sexuality and contraception triggers contamination. The State should emphasize the screening of women, the sensitization of pupils in primary and secondary schools as well as universities in order to reduce the rate of contamination and to raise awareness among the population.

#### Acknowledgements

We thank the administration of the Provincial Hospital of Bongor for their agreement and the funding of this research work. We also thank consenting patients for this study.

#### Authors' Contributions

Gédéon Walbang Ossoga, Ban-bo Bebanto Antipas, Halallah Ngayam, participated in the development of the study project, the data collection and the writing of the article. Langolo Hagassou, Bakarnga-via Issakou supervised the laboratory analyzes and all the stages of this work. All authors contributed to the conduct of this work. All authors have read and approved the final version of the manuscript.

## Conflicts of Interest

This research work was carried out without any incident. The authors declare no conflict of interest.

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## Annex

### Survey sheet

- 1) Name and First names: .....
- 2) Identification code: /...../
- 3) Requesting agency: .....
- 4) Sex: M: /.../ W: /.../
- 5) Age: /...../
- 6) Marital status:  
Bride: /.../ Divorcee: /.../ Widow: /.../ Bachelor: /.../ Free union: / .../
- 7) Level of study:  
Uneducated: /.../ Primary: /.../ Secondary: /.../ University: /.../
- 8) Occupation:  
Household: /.../ Shopkeeper: /.../ Civil servants: /.../ Pupil: /.../  
Student: /.../
- 9) Origin: .....
- 10) Parity: Yes: /...../ No: /...../
- 11) Risk factors:
  - Naivety of the patient's young age: /...../
  - Early sex linked to poverty: /...../
  - Unprotected sex: /...../
  - Lack of education about STIs: /...../
  - Lack of screening: /...../
- 12) Clinical signs: .....
- 13) Medical background: .....
- 14) Results: Positive /.../ Negative: /...../