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## Seroprevalence of toxoplasmosis and rubella in pregnant women attending antenatal private clinic at Ouagadougou, Burkina Faso

Laure Stella Ghoma Linguissi<sup>1</sup>, Bolni Marius Nagalo<sup>1</sup>, Cyrille Bisseye<sup>1,2\*</sup>, Thérèse S Kagoné<sup>1,3</sup>, Mahamoudou Sanou<sup>4</sup>, Issoufou Tao<sup>1</sup>, Victoire Benao<sup>5</sup>, Jacques Simporé<sup>1,6</sup>, Bibiane Koné<sup>5</sup>

<sup>1</sup>Centre de Recherche Biomoléculaire Pietro Annigoni (CERBA/LABIOGENE), UFR/SVT, Université de Ouagadougou, Burkina Faso

<sup>2</sup>Département de Biologie, Université des Sciences et Techniques de Masuku, Franceville, Gabon

<sup>3</sup>Centre MURAZ, Bobo-Dioulasso, Burkina Faso

<sup>4</sup>Centre National de Transfusion Sanguine (CNTS), Ouagadougou, Burkina Faso

<sup>5</sup>Clinique Moussa Koné, Ouagadougou, Burkina Faso

<sup>6</sup>Centre Médical Saint Camille, Ouagadougou, Burkina Faso

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### ABSTRACT

**Objective:** To evaluate the prevalence of toxoplasmosis and rubella among pregnant women at Ouagadougou in Burkina Faso. **Methods:** All patient sera were tested for rubella and toxoplasmosis anti-IgG using commercial ELISA kits (Platelia™ Rubella IgG and Platelia™ Toxo IgG). The presence of anti-rubella and anti-toxoplasmosis IgM in serum samples was tested using commercial ELISA kits Platelia Rubella IgM and Platelia Toxo IgM. **Results:** Among all the pregnant women tested for toxoplasmosis and rubella, their prevalence were 20.3% and 77.0%, respectively. Pregnant women in the age group of 18–25 years showed the highest frequency of anti-toxoplasmosis (34.5%) and anti-rubella IgG (84.6%). The prevalence of anti-toxoplasma and anti-rubella IgG decreased between 2006 and 2008 from 32.7% to 12.1% and 84.6% to 65.0%, respectively. There was no significant association between age and the mean titer of anti-toxoplasmosis IgG among pregnant women. **Conclusions:** The diagnosis of toxoplasmosis and rubella is necessary in pregnant women in Burkina Faso because of the low immunization coverage rate of rubella and the high level of exposure to these two infections which can be harmful to the newborn if contracted by women before the third trimester of pregnancy.

## 1. Introduction

Toxoplasmosis and rubella are two benign diseases when they affect adults or children. Primary infections with *Toxoplasma gondii* (*T. gondii*) and rubella initially unapparent or asymptomatic and lead to serious complications in pregnant women[1].

Congenital infections with *T. gondii* and rubella are a significant cause of neonatal mortality and infant morbidity in the world[2].

Recent studies have estimated that more than one third

of the world population is infected with toxoplasmosis[3,4]. In developed countries, congenital toxoplasmosis affects 0.01% and 0.1% of infants[5,6].

In West Africa, *T. gondii* seroprevalence of 78% and 53.6% have been reported in pregnant women from Nigeria and Benin, respectively[7,8]. The prevalence of *T. gondii* infection is linked to socio-economic situation in several studies[9].

Despite WHO recommendations on rubella vaccination coverage, the infection has not been completely eradicated. In case of rubella infection during the first trimester of the pregnancy, the risk of congenital malformations of the fetus is 90%. In many countries, rubella seropositivity ranging between 54.1% and 95.2% has been reported among women of childbearing age[10].

Due to the non-specificity of clinical symptoms and the

\*Corresponding author: Dr. Cyrille Bisseye, PhD, Centre de Recherche Biomoléculaire Pietro Annigoni (CERBA)/Labiogene, UFR/SVT, Université de Ouagadougou ; 01 BP 364 Ouagadougou 01; Ouagadougou, Burkina Faso, West Africa.  
Tel: +226 78251349  
E-mail: cbisseye@gmail.com

importance of early recognition of in utero infection, the serological screening of *T. gondii* and rubella is based on IgG and IgM detection. The absence of *T. gondii* and rubella anti-IgG before or during the first trimester of pregnancy identifies women at risk for infection and congenital transmission [6].

In Burkina Faso, as in most of sub-Saharan Africa, toxoplasmosis and rubella are not routinely screened in pregnant women and little data on these two infections is available.

This retrospective study aimed to determine the seroprevalence of toxoplasmosis and rubella among pregnant women attending antenatal private clinic at Ouagadougou in Burkina Faso.

## 2. Material and methods

### 2.1. Patients

This retrospective study was conducted from February 2006 to June 2009 and 182 pregnant women attending antenatal clinics during the first trimester of their pregnancy were included. They were referred to the gynecological service of the private clinic Moussa Kone by different socio-medical centres of Ouagadougou.

### 2.2. Rubella and toxoplasma serology

All patient sera were tested for rubella and toxoplasmosis anti-IgG using commercial ELISA kits (Platelia™ Rubella

IgG and Platelia™ Toxo IgG. BIO-RAD, Marnes la Coquette, France). These are solid-phase enzyme immunoassays for the qualitative and quantitative detection of IgG antibodies against rubella and toxoplasmosis in human serum. The presence and amount of anti-rubella and anti-toxoplasmosis IgG in sera were determined by comparing the optical density of samples to be tested with a standard. Antibody levels obtained were expressed in International Units per mL (IU/mL).

The presence of anti-rubella and anti-toxoplasmosis IgM in serum samples was tested using commercial ELISA kits Platelia Rubella IgM and Platelia Toxo IgM (BIO-RAD, Marnes la Coquette, France) following the manufacturer's instructions.

The study was approved by the Joint Saint Camille/CERBA Ethics Committee. Individual informed consent was obtained from all pregnant women.

### 2.3 Statistical analysis

Data analysis was done by Statistical Package for the Social Sciences (SPSS version 17.0) and Epi Info 6.4. The results were considered significant for  $P < 0.05$ .

## 3. Results

One hundred eighty two (182) women were tested for toxoplasmosis serology (IgM and IgG) and one hundred (100) for rubella serology (IgM and IgG). Women included were aged 18 years or above and had been referred for

**Table 1**

Toxoplasmosis and rubella serology among pregnant women from 2006 to 2009 at Ouagadougou (n,%).

Characteristics	No. tested	Toxoplasmosis				No. tested	Rubella				
		IgG		IgM			IgG		IgM		
		Positive	Negative	Positive	Negative		Positive	Negative	Positive	Negative	
Age group (year)											
18–25	29	10 (34.5)	19 (65.5)	5 (17.2)	24 (82.8)	13	11 (84.6)	2 (15.4)	0 (0.0)	13 (100.0)	
26–35	109	19 (17.4)	90 (82.6)	0 (0.0)	109 (100.0)	61	49 (80.3)	13 (19.7)	1 (1.6)	60 (98.4)	
36–50	44	8 (18.2)	36 (81.8)	2 (4.5)	42 (95.5)	26	17 (65.4)	9 (34.6)	0 (0.0)	26 (100.0)	
Total	182	37 (20.3)	145 (79.7)	7 (3.8)	175 (96.2)	100	77 (77.0)	24 (23.8)	1 (1.0)	99 (99.0)	
Year of the test											
2006	49	16 (32.7)	33 (67.3)	6 (12.2)	43 (87.8)	26	22 (84.6)	4 (15.4)	0 (0.0)	25 (100.0)	
2007	55	11 (20.0)	44 (80.0)	0 (0.0)	55 (100.0)	28	24 (85.7)	4 (14.3)	1 (3.6)	27 (96.4)	
2008	33	4 (12.1)	31 (87.9)	0 (0.0)	33 (100.0)	20	13 (65.0)	7 (35.0)	0 (0.0)	20 (100.0)	
2009	43	6 (14.0)	37 (86.0)	1 (2.3)	42 (97.7)	27	18 (66.7)	11 (33.3)	0 (0.0)	27 (100.0)	

**Table 2**

Toxoplasmosis and rubella antibodies titers among pregnant women (IU/mL).

Characteristics	Anti- <i>T. gondii</i> IgG		Anti-rubella IgG	
	Number	Mean±SD	Number	Mean±SD
Age group (years)				
18–25	29	223.7±86.1	13	252.9±280.4
26–35	109	152.2±50.4	61	175.3±177.1
36–50	44	69.0±28.5	26	124.8±138.9

prenatal care at the clinic Moussa Kone from 2006 to 2009. The majority of women tested for toxoplasmosis (59.9%) and rubella (61.0%) were within the age group of 26–35 years. The large proportion of *Toxoplasma* serology (57.8%) and rubella (54.0%) was required between 2006 and 2007.

### 3.1. Toxoplasmosis and rubella seropositivity

Among the 182 women included in the study, 37 (20.3%) were positive for anti-*T. gondii* IgG and seven samples (3.8%) were positive for anti-toxoplasmosis IgM. Of the 100 pregnant women tested for rubella, 77 (77.0%) were positive for anti-rubella IgG while only one woman was positive for IgM (Table 1). Each year, an average of 45 pregnant women were tested for toxoplasmosis and rubella serology in 2006 to 2009 (Table 1).

Pregnant women in the age group of 18–25 years showed the highest frequency of anti-toxoplasmosis (34.5%) and anti-rubella IgG (84.6%) (Table 1). The rate of anti-toxoplasmosis IgG was significantly higher among pregnant women aged 18–25 years compared to the 26–35 years group ( $P = 0.044$ ). The prevalence of anti-*Toxoplasma* and anti-rubella IgG decreased between 2006 and 2008 from 32.7% to 12.1% and 84.6% to 65.0%, respectively (Table 1).

### 3.2. Antibody titer to *T. gondii* and rubella in pregnant women

As shown in Table 2, means titers of anti-rubella and toxoplasmosis IgG were calculated among pregnant women (Table 2). The mean values of anti-toxoplasmosis IgG were (223.7±86.1), (152.2±50.4) and (69.0±28.5) IU/mL in age groups 18–25; 26–35 and 36–50 years, respectively. There was no significant difference in the mean titer of anti-toxoplasmosis IgG between the three age groups. The mean titer of anti-rubella IgG was higher among women aged 18–25 years with (252.9±280.4) IU/mL. But this titer was not significantly higher than that of other groups.

## 4. Discussion

In developed countries, toxoplasmosis and rubella screening is part of the health tests included in the prenatal assessment. Toxoplasmosis contracted during the first trimester of pregnancy is responsible for spontaneous abortions, stillbirth or severe illness in more than 25% of pregnant women.

Despite the existence of an effective vaccine, infection due to rubella virus is not eradicated. Epidemics occur at regular intervals in the world.

The aim of this retrospective study was to determine the seroprevalence of toxoplasmosis and rubella among

pregnant women during the first trimester of pregnancy and to assess the potential risk of congenital transmission of these diseases in Burkina Faso.

From the total of 182 sera of pregnant women 37 (20.3%) and 7 (3.8%) were reactive for anti-toxoplasma IgG and IgM, respectively.

The prevalence of anti-toxoplasma antibodies found in this study is lower than that found in most developed countries: 43.8% in France<sup>[11]</sup> and in Africa: 75.4% in Nigeria<sup>[7]</sup>; 53.6% in Benin <sup>[8]</sup>; 40.2% in Dakar, Senegal<sup>[12]</sup>; and 34.1% from pregnant women in Sudan<sup>[13]</sup>. It is comparable to the prevalence found by Simpre *et al* in Burkina Faso<sup>[14]</sup>. However, it is higher than the prevalence of 12.8% observed among pregnant women in South Africa<sup>[15]</sup>. In developed countries, toxoplasmosis and rubella screening is part of the health tests included in the prenatal assessment. Toxoplasmosis contracted during the first trimester of pregnancy is responsible for spontaneous abortions, stillbirth or severe illness in more than 25% of pregnant women.

In our study, the prevalence of rubella IgG was 77% and only one woman carried anti-rubella IgM. This prevalence of rubella is lower than the prevalence of 95.3% and 97.9% found in Mozambique<sup>[16]</sup> and Nigeria<sup>[17]</sup>, respectively.

The prevalence of rubella in pregnant women in Burkina Faso is higher than the 0.42% of prevalence found in childbearing age women in Turkey<sup>[18]</sup>.

We found a high proportion of non-immune pregnant women who are at risk of contracting toxoplasmosis (65.5%) and rubella (15.4%) in the third trimester of pregnancy, especially in the age group of 18–25 years.

*Toxoplasma* (57.8%) and rubella (54.0%) serologies have been mostly requested in 2006 and 2007. Few women seek toxoplasmosis and rubella serologies during pregnancy in Burkina Faso. This could be due to the relatively high cost of these two tests (the cost is approximatively 32 Euros) for predominantly low-income populations.

In most of sub-Saharan countries, the efforts of health authorities are focused on sexually transmitted diseases such as HIV. Diseases such as toxoplasmosis and rubella are neglected.

Although there is an effective vaccine against rubella, immunization coverage is low and affects only 48% of the population in developing countries<sup>[19,20]</sup>. Toxoplasmosis and rubella diagnosis should be systematic in Burkina Faso, because of the existence of a strong agro-pastoral activity especially in rural areas, which increases the spread of zoonotic diseases<sup>[21]</sup>. Indeed, previous studies have shown that the coexistence between humans and animals may be a contributing factor raising these zoonotic infections<sup>[3, 21]</sup>.

Meat and milk are important dietary components for the majority of the population in Burkina Faso. A study in Brazil <sup>[3]</sup> showed that frequent consumption of poultry (chicken), fruit juice manufactured locally and vegetables washed with

untreated water was significantly associated with *T. gondii* infection in pregnant women. However, contamination of water by oocytes could be the most likely source of infection with toxoplasmosis and rubella in Burkina Faso.

The diagnosis of toxoplasmosis and rubella is necessary in pregnant women in Burkina Faso because of the low immunization coverage rate of rubella and the high level of exposure to these two infections which can be harmful to the newborn if contracted by women before the third trimester of pregnancy.

### Conflict of interest statement

The authors declare no conflict of interest.

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### References

- [1] Ocak S, Zeteroglu S, Ozer C, Dolapcioglu K, Gungoren A. Seroprevalence of *Toxoplasma gondii*, rubella and cytomegalovirus among pregnant women in southern Turkey. *Scand J Infect Dis* 2007; **39**(3): 231–234.
- [2] Binnicker MJ, Jespersen DJ, Harring JA. Multiplex detection of IgM and IgG class antibodies to *Toxoplasma gondii*, rubella virus, and cytomegalovirus using a novel multiplex flow immunoassay. *Clin Vaccine Immunol* 2010; **17**(11): 1734–1738.
- [3] Sroka J, Wojcik–Fatla A, Szymanska J, Dutkiewicz J, Zajac V, Zwolinski J. The occurrence of *Toxoplasma gondii* infection in people and animals from rural environment of Lublin region – estimate of potential role of water as a source of infection. *Ann Agric Environ Med* 2010; **17**(1): 125–132.
- [4] Edelhofer R, Prossinger H. Infection with *Toxoplasma gondii* during pregnancy: seroepidemiological studies in Austria. *Zoonoses Public Health* 2010; **57**(1): 18–26.
- [5] Gilbert RE, Gras L, Wallon M, Peyron F, Ades AE, Dunn DT. Effect of prenatal treatment on mother to child transmission of *Toxoplasma gondii*: retrospective cohort study of 554 mother–child pairs in Lyon, France. *Int J Epidemiol* 2001; **30**(6): 1303–1308.
- [6] Montoya JG, Liesenfeld O. Toxoplasmosis. *Lancet* 2004; **363**(9425): 1965–1976.
- [7] Onadeko MO, Joynson DH, Payne RA, Francis J. The prevalence of toxoplasma antibodies in pregnant Nigerian women and the occurrence of stillbirth and congenital malformation. *Afr J Med Med Sci* 1996; **25**(4): 331–334.
- [8] Rodier MH, Berthonneau J, Bourgoin A, Giraudeau G, Agius G, Burucoa C, et al. Seroprevalences of *Toxoplasma*, malaria, rubella, cytomegalovirus, HIV and treponemal infections among pregnant women in Cotonou, Republic of Benin. *Acta Trop* 1995; **59**(4): 271–277.
- [9] Nissapatorn V, Suwanrath C, Sawangjaroen N, Ling LY, Chandeying V. Toxoplasmosis–serological evidence and associated risk factors among pregnant women in Southern Thailand. *Am J Trop Med Hyg* 2011; **85**(2): 243–247.
- [10] Uyar Y, Balci A, Akcali A, Cabar C. Prevalence of rubella and cytomegalovirus antibodies among pregnant women in northern Turkey. *New Microbiol* 2008; **31**(4): 451–455.
- [11] Berger F, Goulet V, Le Strat Y, Desenclos JC. Toxoplasmosis among pregnant women in France: risk factors and change of prevalence between 1995 and 2003. *Rev Epidemiol Sante Publique* 2009; **57**(4): 241–248.
- [12] Faye O, Leye A, Dieng Y, Richard–Lenoble D, Diallo S. Toxoplasmosis in Dakar: Seroepidemiologic sampling of 353 women of reproductive age. *Bull Soc Pathol Exot* 1998; **91**(3): 249–250.
- [13] Elnahas A, Gerais AS, Elbashir MI, Eldien ES, Adam I. Toxoplasmosis in pregnant Sudanese women. *Saudi Med J* 2003; **24**(8): 868–870.
- [14] Simpre J, Savadogo A, Ilboudo D, Nadambega MC, Esposito M, Yara J, et al. *Toxoplasma gondii*, HCV, and HBV seroprevalence and co–infection among HIV–positive and –negative pregnant women in Burkina Faso. *J Med Virol* 2006; **78**(6): 730–733.
- [15] Kistiah K, Barragan A, Winiecka–Krusnell J, Karstaedt A, Freaan J. Seroprevalence of *Toxoplasma gondii* infection in HIV–positive and HIV–negative subjects in Gauteng, South Africa. *South Afr J Epidemiol Infect* 2011; **26**(4)(Part I): 225–228.
- [16] Barreto J, Sacramento I, Robertson SE, Langa J, de Gourville E, Wolfson L, et al. Antenatal rubella serosurvey in Maputo, Mozambique. *Trop Med Int Health* 2006; **11**(4): 559–564.
- [17] Mohammed–Durosinlorun A, Shittu O, Sadauki H, Olayinka A, Kolawole B, Adejo D. Prevalence of rubella IgG antibodies among pregnant women in Zaria, Nigeria. *Inter Health* 2010; **2**(2): 156–159.
- [18] Akyar I. Seroprevalence and coinfections of *Toxoplasma gondii* in childbearing age women in Turkey. *Iranian J Publ Health* 2011; **40**(1): 63–97.
- [19] Robertson SE, Featherstone DA, Gacic–Dobo M, Hersh BS. Rubella and congenital rubella syndrome: global update. *Rev Panam Salud Publica* 2003; **14**(5): 306–315.
- [20] Zeng YB, Zhu SH, Dong H, Han HY, Jiang LL, Wang Q, et al. Great efficacy of sulfachloropyrazine–sodium against acute murine toxoplasmosis. *Asian Pac J Trop Biomed* 2012; **2**(1): 70–75.
- [21] Coulibaly ND, Yameogo KR. Prevalence and control of zoonotic diseases: collaboration between public health workers and veterinarians in Burkina Faso. *Acta Trop* 2000; **76**(1): 53–57.