

Seroprevalence of Rubella IgG Antibody among Pregnant Women Attending Antenatal Clinic in Lomé, Togo

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Abstract Background: In non-immune women in the first trimester of pregnancy, *Rubella Virus* (RV) infection can lead to congenital rubella syndrome (CRS). In Togo, very little is known about the rubella seroprevalence. **Objective:** To assess the rate of immunization against Rubella Virus among pregnant women. **Methods:** Serum samples obtained from 232 pregnant women were tested for rubella-specific IgG antibodies using a commercial ELISA kit. **Results:** Overall, the seroprevalence of rubella-specific IgG antibodies was 85% (192/226) [CI 95%: 82.7- 87.3%]. All of the seropositive pregnant women had a protective level (titre > 10 UI/mL). The rates of immunization increased with age and gravidity but differences were not statistically significant. **Conclusions:** The high rate of immunization found, in absence of a routine vaccination program supports the presence of an endemic rubella infection in Lomé. To prevent CRS and eliminate RV, free access to vaccination for at least children and women of childbearing age in Togo is advocated.

Keywords: *Rubella Virus*, seroprevalence, pregnancy, Africa

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1. Introduction

Rubella virus (RV) belongs to the *Togaviridae* family and genus *Rubivirus* of which it is the sole member [1,2]. It is enveloped by an icosahedral nucleocapsid protected by a lipid bilayer membrane and has a positive sense single-stranded RNA [2]. The virus is transmitted via respiratory route and is responsible for a disease called Rubella also known as German measles [2,3]. Rubella virus causes mild infection in adults and is characterized by malaise, low-grade fever and a morbilliform rash appearing on the same day [4,5]. However, during pregnancy, the infection may lead to miscarriage, fetal death or the birth of the infant with congenital rubella syndrome (CRS) [6,7].

The clinical diagnosis is difficult to establish because Rubella symptoms are transient and discreet [8]. In laboratory, Rubella screening is carried out by titration of Rubella virus specific antibodies on a first sample performed during a suspicious spurt and on a second sample, fourteen days later to detect a possible increase in immunoglobulin G (IgG), which represent signs of

progress of the disease. Rubella specific IgG can be detected in the plasma of a vaccinated individual and in an immunized subject after an infection

To prevent Rubella infections, an effective live attenuated virus vaccine is available. This vaccine is combined with measles and mumps vaccine. In many developed countries from north America and Europe, its implementation in immunization program leads to virtual elimination of the pathogen [9,10,11]. Thus, nowadays, congenital rubella can be prevented by the vaccination of women in childbearing age [11,12]. However, in most sub-Saharan countries, monitoring programs for rubella prevention are lacking. In Togo, preventive vaccination against *Rubella Virus* is not systematic and data on rubella seroprevalence is lacking. These situations expose children born to unprotected mothers to the risks related to maternal infection during the pregnancy.

Until 2009, only 2 countries over the 46 members of the World Health Organization, African Region, introduced Anti-rubella vaccine into their national programs. In Togo like in most African countries the epidemiology of Rubella is not well known.

The aim of this study was to determine the seroprevalence of rubella IgG antibody among pregnant

women receiving antenatal care. Such information is essential to demonstrate the need to support preventive vaccination, especially among women of childbearing age, to determine a potential risk for vertical transmission of the Rubella virus from mother to child.

2. Patients and Methods

This was a cross-sectional study carried out between July 1st, 2013 and August 30th, 2013 at the Sylvanus Olympio University Hospital in Lomé, the capital city of Togo, a small country of 6 millions inhabitants located in west Africa. Participants provided their informed consent. Data on age, education level, marital status, gestation age and knowledge of the disease were collected using a questionnaire. Venous blood samples were collected from pregnant women in the Obstetrics and Gynecology Unit of the hospital. All samples were transported to the laboratory on the day of collection for serum extraction and subsequent storage at -20°C . Serum samples were screened with a commercial ELISA (enzyme-linked immunosorbent assay) test VIDAS® RUB IgG II to detect Rubella Virus (RV) IgG antibodies. In accordance with the manufacturer's instructions, samples with IgG antibody concentration ≥ 10 IU/ml were classified as seropositive while samples with an IgG antibody titer < 10 IU/ml were considered as seronegative. Equivocal samples were retested and if the result was confirmed, the sample was classified as equivocal.

Before the collection of sample, information regarding the study was explained to the subjects. Oral consent for participation in the study was obtained in French language or in local vernacular.

Data analysis was made using the chi-square test and Fisher's exact test when appropriate.

3. Results

Table 1. Characteristics of study population

| | | Outcome |
|----------------------------|-----------------------------|--------------|
| Age (years) | Mean | 28 |
| | Minimum-maximum | 15-44 |
| | Median, (IQR) | 28, (24 -32) |
| Age group, n (%) | 15-20 years | 16 (6.9) |
| | 21-25 years | 57 (24.6) |
| | 26-30 years | 76 (32.8) |
| | 31-35 years | 59 (25.4) |
| | >35 years | 24 (10.3) |
| Marital status, n (%) | Married | 216 (93) |
| | Single | 16 (7) |
| | Illiterate | 32 (13.8) |
| Education status, n (%) | Primary | 83 (35.8) |
| | Secondary | 114(49.1) |
| | Tertiary | 3(1.3) |
| | First trimester | 42 (18) |
| Pregnancy trimester, n (%) | Second trimester | 95 (41) |
| | Third trimester | 95 (41) |
| | Primigravida | 50 (21.6) |
| Gestivity, n (%) | N° pregnancy =2 | 81 (34.9) |
| | Multigravida ($n \geq 3$) | 101 (43.5) |
| Rubella knowledge, n (%) | Yes | 7 (3) |
| | No | 225 (97) |

During the study period, 232 pregnant women aged between 15 and 44 years with a median of 28 years were recruited. Only 7(3%) pregnant women had knowledge of Rubella Virus infection and they worked in sector of health. The epidemiologic characteristics of the study population are shown in [Table 1](#).

Out of 232 pregnant women tested for rubella IgG antibody, 192 (82.8%) were positive, 6 (2.6%) were equivocal and 34 (14.6%) were negative. Overall, the prevalence of rubella IgG antibody was 85% (192/226) [CI 95%: 82.7- 87.3%]. All of the positive pregnant women had protective level (titre ranging from 22.8 to 385 UI/mL) of anti-rubella IgG. The prevalence of rubella IgG antibody in relation with pregnant women age and obstetrical parameters is presented in [Table 2](#).

Table 2. Prevalence of rubella IgG antibody by age group, gestational age and gravidity

| | IgG antibody prevalence, n/n tested (%) | |
|---------------------|---|--------------|
| Age group | 15-20 years | 12/16 (75) |
| | 21-25 years | 47/55 (85.5) |
| | 26-30 years | 63/75 (84) |
| | 31-35 years | 48/56 (85.7) |
| | >35 years | 22/24 (91.7) |
| Pregnancy trimester | First trimester | 40/41 (97.6) |
| | Second trimester | 74/94 (78.7) |
| | Third trimester | 78/91 (85.7) |
| Gestivity | Primigravida | 40/48 (83.3) |
| | N° pregnancy =2 | 62/78 (79.5) |
| | Multigravida ($n \geq 3$) | 90/100 (90) |

The lowest rate (75%) of seropositivity was found in the most younger pregnant women group (15-20 years) while highest rate (91.7%) of immunization was found in age group > 35 years ([Table 2](#)) but the difference is not statistically significant ($p=0.155$). Analysis of rubella IgG antibodies prevalence by gravidity showed a higher rate (90%) in multigravida women ([Table 2](#)). However, there was no significant difference according to number of pregnancies ($p=0.058$). Based on gestational age, the rate of seropositivity was 97.6%, 78.7% and 85.7% respectively in first, second and third trimester ([Table 2](#)). The difference of immunization rates between women in first trimester and the others is statistically significant ($p=0.0132$).

4. Discussion

In this study, the screening of RV IgG antibody amongst pregnant women reveals a high proportion (85%) of immunization subjects. This seroprevalence rate is similar to those reported in other African countries [13-20]. Although our report is about 226 pregnant women, the high rate of immunity found suggests a well-supported and continuous transmission of endemic Rubella Virus at least in Lomé the capital city of Togo.

We found that immunization rate increased with maternal age group. Our observation is similar to previous studies [16,21,22] in Nigeria. Given that the difference of prevalence according to age group and gestivity are not statistically significant, we could suggest that most infections in women of childbearing age were probably acquired earlier before age of 15 years [23,24]. Upon RV IgG antibodies prevalence found in relation to gestational

age, most of women in first trimester (97.6%) were protected (ie RV IgG antibody titer >10UI/mL) and were also able to prevent the transmission of RV to their babies and avoid CRS. In Togo, the burden of rubella infection is not well known due to paucity of data. Even, the rate of immunization against RV is high, this study highlights a susceptible pregnant women population (40/232)(17.2%) with a risk of acquiring rubella infection regardless of age and able to causing a congenital rubella syndrome in their babies. Due to absence of serious clinical symptoms in the disease coupled with a high seroprevalence found in this study, a national program of prevention and elimination of *Rubella Virus* in Togo must first promote a free antibody testing in populations and secondly proceed to vaccination of non-protected individuals.

5. Conclusions

Humans are the only known reservoir for Rubella Virus; maintenance of rubella requires continuous access to a susceptible population. In Togo, where there is an absence of a routine vaccination program, non-immune population is susceptible to rubella infection. Thus, despite an important immunization rate amongst pregnant women, the risk of CRS is still present nowadays in the country. The endemicity of the infection suggests promoting a free vaccination program for at least children and women of childbearing age.

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Conflict of Interest

None to declare.

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