**Epidemiological profile of rubella in pregnant women in the city of Conakry , Republic of Guinea**

Abstract

**Introduction**: Rubella is a generally benign contagious viral disease that mainly affects children and young adults. However, it can cause serious congenital malformations when women are infected early in pregnancy. **Objective**: To contribute to the diagnosis of rubella in pregnant women in Conakry with a view to improving their care. **Methods**: This prospective, descriptive and analytical study lasted 6 months, from 01 July to 31 December 2024. The Euroimmun IgM measles ELISA kit was used to test for anti-measles and anti-rubella immunoglobulin M. **Results**: 304 samples were examined. All age groups were involved, but IgG was detected much more in pregnant women aged 24 to 34 and 13 to 23, with prevalence of diseaseof 43.42% and 39.42% respectively. Women with a marriage certificate were the most represented, at 65.13%, compared with 26.97% of pregnant women without a marriage certificate. The socio-professional categories show that out of the 304 samples examined, women in management positions are the most represented with 210 cases and 5 positive results, or 1.64%, followed by students with 36 cases, 14 sales agents, 28 administrative staff with one woman in each group affected by rubella, 9 security agents and 7 farmers, all of whom tested negative for rubella. The commune of Matoto was the most represented, at 55.59%. With regard to immunoglobin M, of the 304 samples received at the laboratory, 8 had IgM, i.e. 2.64%, compared with 97.36% of negative cases. The 24-34 age group was the most affected, with an anti-rubella IgM detection rate of 1.64%. Pregnant women with a certificate were the most represented, at 1.64%, compared with 0.98% of pregnant women without a marriage certificate. The commune of Matoto was the most affected, at 1.32%. In terms of immunoglobulin G, 280 of the 304 samples tested contained immunoglobulin G, giving a seroprevalence rate of 92.11%. **Conclusion**: Rubella infection in pregnant women remains a major concern because of the potential severity of maternal and foetal damage.

**Key words**: *Epidemiological profile, Rubella, Pregnant women, Conakry,*

**1. INTRODUCTION**

Rubella is a generally benign contagious viral disease that mainly affects children and young adults. However, it can cause serious congenital malformations when women are infected early in pregnancy. It can also lead to spontaneous abortion, in-utero death and progressive generalised infection of the newborn, known as congenital rubella syndrome (CRS) [1].

Transmission occurs via direct human-to-human contact and only by the respiratory route, and from mother to foetus. During viremia, the virus infects the placenta and can be transmitted to the foetus, although the majority of transmissions are observed during primary rubella infection in pregnant women [2;3].

According to the WHO (2024), rubella is the leading cause of congenital malformations that can be prevented by vaccination, responsible each year worldwide for the birth of approximately 100,000 infants with congenital rubella syndrome (CRS). Infection with the rubella virus during pregnancy can lead to miscarriage, foetal death or CRS. The most serious damage occurs early in pregnancy, particularly during the first trimester. Even though a safe and cost-effective vaccine is available, there were an estimated 17,865 cases of rubella in 78 countries in 2022 [4].

The United States of America (USA) has not reported a single case of naturally transmitted rubella since 2005 [5].

In Canada, the average incident rate fell from 0.2000 in 1998 to 0.0003 in 2011 [6].

In contrast to these countries, rubella remains a real public health problem in developing countries (in Africa, South-East Asia and the Middle East). The World Health Organisation (WHO) estimates that 100,000 children a year are born with congenital rubella syndrome [5].

By 2024, 175 out of 194 countries had introduced the rubella vaccine, and global coverage was estimated at 69%. Reported cases of rubella have fallen by 97%, from 670,894 cases in 102 countries in 2000 to 17,865 cases in 78 countries in 2022. CRS rates are highest in the WHO regions of Africa and South-East Asia, where vaccination coverage is lowest [4].

In Côte d'Ivoire, a study conducted in 2020 reported a rubella antibody seropositivity rate in 82% of pregnant women [7].

In Madagascar, a study was carried out in 2019. Out of 562 sera studied, 450 showed rubella antibodies, i.e. 80.1% [8].

In 2024, the World Health Organisation (WHO) observed a significant decline in rubella cases worldwide, with 175 out of 194 countries having introduced rubella vaccines. Globally, vaccination coverage was estimated at 69% in January 2024. While the incidence of rubella has declined significantly in many countries, including the United States, where it is now rare thanks to widespread vaccination, it continues to circulate in other parts of the world, according to the CDC. The WHO, in collaboration with other organisations such as UNICEF and Gavi, is actively working to eliminate rubella and its complications, such as congenital rubella syndrome (CRS), through vaccination campaigns and awareness-raising activities [4].

The Republic of Guinea is one of the countries that periodically experience measles outbreaks; the last major epidemic dates back to 2009, with 4,755 cases and 10 deaths throughout the country. The communes of Conakry were the health districts most affected, accounting for 82% (3,900) [10]. The aim of this study is to contribute to the diagnosis of rubella in pregnant women in Conakry, with a view to their management.

This study is original

**2. MATERIALS AND WORKING METHODS**

Our study was carried out at the Centre de Recherche en Virologie - Laboratoire des Fièvres Hémorragiques Virales de Guinée (CRV-LFHVG), at the Microbiology Laboratory of the Gamal Abdel Nasser University in Conakry and at the Medical Biology Analysis Laboratory of the Mahatma Gandhi University. This is a prospective, descriptive and analytical study lasting six (6) months from 1 July to 31 December 2024. Our study population consisted of all pregnant women presenting with moderate fever with a few aches and pains; headache; sore throat due to pharyngitis; conjunctivitis; increase in the size of lymph nodes (adenopathies) behind the ears and in the neck region that persisted for one to two weeks during the period of our survey. Sampling was simple random and the sample size (n = 304) was calculated using the Schwartz formula. Rubella IgM and Rubella IgG were our biological variables. Age, marital status and residence were our epidemiological variables.

**2.1 Biological analysis procedure and interpretation of results**

Principle

The kit uses an indirect ELISA test in which the antigen is bound to the bottom of the microplate well, and then an antibody specific to the antigen is added. A secondary antibody, conjugated to an enzyme or other detection molecule, is then bound to the first antibody for detection. A substrate that produces a chromogenic compound as the final product is added.

Different stages of analysis in the laboratory

Step 1: Add 10 µl of sample + 1000 µl of dilution buffer;

Add 10 µl of control serum + 1000 µl of dilution buffer;

Incubate for 10 minutes at room temperature.

Step 2: Add the diluted samples and ready-to-use control/standard sera to the wells (100 µl); incubate for 30 minutes at room temperature.

Step 3: Wash (3 × 450 µl wash buffer); incubate for 30 to 60 seconds for each wash before emptying.

Step 4: Add the conjugate (100 µl); incubate for 30 minutes at room temperature.

Step 5: Wash (3 × 450 µl wash buffer); incubate for 30 to 60 seconds for each wash before emptying.

Step 6: Add the substrate (100 µl); incubate for 15 minutes at room temperature away from light.

Step 7: Add the stop solution (100 µl) STOP.

Step 8: Read from 0 to 450 nm/reference wavelength at 630 nm.

Interpretation of results

After reading the plate on the reader, the results are interpreted based on the optical densities (OD) obtained.

OD from 0 to 0.8: negative sample;

OD from 0.8 to 1: indeterminate sample;

OD ≤ 1.1: positive sample.

**2.2 Data analysis**

The data collected on the survey forms were collected, tabulated, entered, processed and analysed using Kobo Collection and SPSS version 2021 software.

Limitations and difficulties

The lack of information among some patients and the failure to perform PCR and sequencing were our limitations and difficulties.

**3. RESULTS AND DISCUSSION**

**Table 1**: *Distribution of pregnant women with rubella according to sociodemographic characteristics and immunoglobulin M (IgM).*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters | Number | Positive | Percentage (%) | 95% CI |
| Age groups | | | | |
| 13 -23 years 133 3 0,98 -0,12-2,08  24 – 34 years 141 5 1,64 0,21-3,06  35 – 45 years 28 - - -  46 years and over 2 - - - | | | | |
| Marital status | | | | |
| Women with  Marriage certificate 211 5 1,64% 0,21-3,06  Women without  Marriage certificate 93 3 0,98% -0,12-2,08 | | | | |
| Socio-professional categories | | | | |
| Housewives 210 5 1,64 0,21-3,06  Pupils/students 36 1 0,32 -0,31-0,95  Sales agents 14 1 0,32 -0,31-0,95  Administrative staff 28 1 0,32 -0,31-0,95  Security guards 9 - - -  Female farmers 7 - - - | | | | |
| Residences | | | | |
| Matoto 180 4 1,32 0,03 - 2,60  Ratoma 64 1 0,32 -0,31-0,95  Kaloum 22 3 0,99 -0,12-2,10  Matam 20 - - -  Dixinn 18 - - - | | | | |

A breakdown of patients by age showed that the 24-34 age group was the most affected (1.64%), followed by the 13-23 age group (0.98%). The average age in our study was 25, with extremes of 13 and 47. These data are lower than those found by Tabache and Fellag 2019 in Algeria who reported a seroprevalence of 4.16% in the 24-35 age group [10].

With regard to marital status, women with a marriage certificate were the most affected by the rubella virus, with 5 cases (1.64%) (Table 1). Our results are much lower than those reported by Njiki-Bikoï et al,2024 in Chad, who found a seroprevalence of 23.07% in pregnant women with a marriage certificate and 18.81% in pregnant women without a marriage certificate [11].

The socio-professional categories show that out of the 304 samples examined, women in management positions are the most represented with 210 cases and 5 positive results, or 1.64%, followed by students with 36 cases, 14 sales agents, 28 administrative staff with one woman in each group affected by rubella, 9 security agents and 7 farmers, all of whom tested negative for rubella.

In terms of origin, the commune of Matoto was the most represented with 4/8 cases, i.e. a seroprevalence of 1.32%. This high prevalence in our study is not surprising, as the majority of pregnant women came from the commune of Matoto.

**Table 2**: *Distribution of pregnant women with rubella according to sociodemographic characteristics and immunoglobulin G (IgG).*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters | Numbers | Positive | Percentage (%) | 95%CI |
| Tranches d’âges | | | | |
| 13 -23 years 133 120 39,47 33,99-44,96  24 – 34 years 141 132 43,42 37,84-48,99  35 – 45 years 28 26 8,55 5,40-11,69  46 years and over 2 2 0,66 -0,25-1,55 | | | | |
| Marital status | | | | |
| Women with  Marriage certificate 211 198 65,64% 59,77-70,49  Women without  Marriage certificate 93 82 26,97% 21,98-31,95 | | | | |
| Residences | | | | |
| Matoto 180 169 55,59 50,00 -61,17  Ratoma 64 56 18,42 14,06-22,77  Kaloum 22 19 6,25 3,52-8,97  Matam 20 20 6,57 3,78-9,35  Dixinn 18 16 5,26 2,75-7,75 | | | | |

The distribution of pregnant women according to immunoglobulin G showed that the 24-34 age group was the most affected, with 132/304 positive cases, representing a prevalence of 43.42%, followed by the 13-23 age group (39.47%). The 46 and over age group was the least represented (0.66%). This high prevalence among pregnant women in the city of Conakry could be explained by immunisation of pregnant women against the rubella virus. Our results are lower than those found by Njiki-Bikoï et al in 2024, in Chad, who reported 59.25% in the 25-30 age group and 89.18% in the 20-25 age group [11], but similar to those of Housna in 2011 in Morocco, who found 43.51% in the 15-24 age group [12].

In terms of marital status, pregnant women with a marriage certificate were the most represented, with 198/304 positive cases, i.e. a seroprevalence of 65.64%, compared with 26.97% of pregnant women without a marriage certificate. These results show that the majority of women with marriage certificates had already contracted the disease. These results are lower than those found by Njiki-Bikoï et al, in 2024, in Chad, who found 86.20% among women with a marriage certificate and 66.66% among women without a marriage certificate [11].

According to the results reported by Sylvester et al., in 2025, in South Sudan, out of 4,944 serum samples collected, 2,083 (42.1%) were positive for measles immunoglobulin M antibodies. Among the 2,861 samples that were negative or indeterminate for measles, 678 (23.7%) were positive for rubella immunoglobulin M antibodies. The study observed a significant increase in rubella positivity rates, from 1.6% in 2014 to 34.4% in 2020 [13]. Logistic regression analysis showed that rubella infection was significantly more common in children aged 5 to 9 years (odds ratio [OR] = 2.234; 95% confidence interval [CI]; 1.468-3.473, P < 0.001), aged 10 to 14 (OR = 2.101; 95% CI, 1.570-4.428; P < 0.001) and 1 to 4 years (OR = 1.733; 95% CI, 1.149-2.687; P = 0.003), compared with children under 1 year of age (reference group) [13]. Rubella positivity was also slightly higher in urban areas than in rural areas (OR = 1.139; 95% CI, 1.004-1.527; P = 0.034). Rubella cases showed marked seasonality, with an increase in cases from December onwards and a peak in March.

**Table 3**: *Distribution of rubella virus patients according to immunoglobulin M (IgM).*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N° | IgM | Number | Percentage (%) | 95% CI |
| 1 | Positive | 8 | 2,64 | 0,83-4,44 |
| 2 | Negative | 296 | 97,34 | 95,53-99,14 |
| Total | | **304** | **100** | **100-100** |

This table shows that out of 304 pregnant women tested, 8 had immunoglobulin M, i.e. 2.64%, compared with 296 negative cases (97.34%). This shows that the majority of women have no recent infection. Our results are superior to those found by Mariko in Bamako in 2024 with a seroprevalence of 1.96% immunoglobulin M [13].

With regard to residence, we found that anti-rubella IgG antibodies were detected in the sera of pregnant women sampled in all the communes of the city of Conakry. However, the highest seroprevalence was observed among pregnant women in the commune of Matoto, followed by Ratoma, with 55.59% and 18.42% respectively.

**Table 4**: *Distribution of patients with rubella virus according to immunoglobulin G (IgG).*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N° | IgG | Number | Percentage (%) | 95% CI |
| 1 | Positive | 280 | 92,11 | 89,07-95,14 |
| 2 | Negative | 24 | 7,89 | 4,85-10,92 |
| Total | | **304** | **100** | **100-100** |

This table shows that, of the 304 samples tested, 280 contained immunoglobulin G, giving a seroprevalence of 92.11%. This indicates that the majority of pregnant women were exposed to the rubella virus and developed an immune response, as evidenced by the presence of IgG.

Contrary to our results, other authors report that the highest prevalence was observed in school-aged children (5–14 years), which is consistent with studies conducted in Ethiopia and Ghana [14, 15]. The high positivity rates in the 5-14 age group, as shown by the results of Lambert et al. and a recent Ethiopian study [16], suggest that significant social interactions in the school environment facilitate transmission. In contrast, a study conducted in Hangzhou, China, found that the most affected group was young adults (20–24 years old) [17], highlighting regional differences in the epidemiology of rubella.

Our results are superior to those found by Landry in 2016 in Côte d'Ivoire, who reported a seroprevalence of 72.34% IgG [18].

**4. Conclusion**

The results of this study showed that the majority of pregnant women had been exposed to the rubella virus and had developed immunity, as evidenced by the high seroprevalence of IgG in this study. Other pregnant women had the presence of immunoglobulin M, which explains their recent infection with the rubella virus. These high seroprevalences call on the health authorities to organise campaigns to raise public awareness and change behaviour by applying rubella prevention measures, as well as rubella screening campaigns for pregnant women. Finally, to vaccinate women who have not been immunised against rubella.

Recommendations

* Promote routine vaccination against rubella for women of childbearing age, particularly before pregnancy ;
* Integrate rubella screening into prenatal care to identify non-immune women ;
* Launch information campaigns to raise awareness among women and healthcare professionals about the risks of rubella during pregnancy;
* Create protocols for monitoring pregnant women exposed to or infected with rubella, with a specialised centre to manage complex cases.

**Consent**

Before administering the questionnaire, the consent of each patient was sought. The validity of the work was explained beforehand and the anonymity of the data was respected.

**Ethical approval**

In accordance with international or university standards, written ethical approval was obtained and retained by the authors.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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