**Epidemiological profile of measles rash in the city of Greater Conakry (Republic of Guinea)**

**Abstract**

**Introduction**: Measles and rubella are highly contagious viral infections for which there is no effective antiviral treatment. **Objective**: To contribute to surveillance efforts as part of the elimination of measles and rubella in Guinea. **Methods**: This is a prospective, descriptive, and analytical cross-sectional study that was conducted over a ten-month period from 1 January to 1 November 2024. The Euroimmun IgM measles ELISA kit was used to test for anti-measles and anti-rubella immunoglobulin M. Results: Out of 300 samples suspected of measles and rubella, females were the most affected with a prevalence of 25.33% compared to 22.67% for males for measles, with a sex ratio of 1.03 in favour of females. Unlike rubella, both females and males were affected equally, with a prevalence of 1.28% each. The 0-10 age group was the most affected, with a prevalence of 47.33% for measles. In the same age group, the prevalence of rubella was 2.57%. Of the 144 samples that tested positive for anti-measles IgM, representing a prevalence of 48%, four of the 156 samples that tested negative for measles tested positive for anti-rubella IgM, representing a prevalence of 2.57%. Among vaccinated individuals, out of 53 patients, 12 tested positive, 3 were indeterminate and 39 tested negative for measles virus immunoglobulin M, representing 22.64%, 73.58% and 5.66% respectively. Patients from the Matoto district were the most affected by measles, with a prevalence of 12.34%, followed by those from Ratoma with 11.33%. However, the municipality of Coyah was the most affected by rubella, with a prevalence of 1.92%, followed by Ratoma with 0.64%. 48% of patients had anti-measles immunoglobulin M, and of the 156 patients suspected of having measles who tested negative, only 4 samples tested positive for anti-rubella IgM, or 2.57%. In our study, we note that out of 300 samples suspected of measles, 18% had been vaccinated, 51% had not been vaccinated, and 31% had unknown vaccination status. **Conclusion**: Measles and rubella are a public health problem in Guinea, and management requires monitoring of IgM and IgG.

***Key word*** *: Epidemiological profile, Measles, Rubella, Conakry.*

**1. INTRODUCTION**

Measles and rubella are highly contagious viral infections for which there is no effective antiviral treatment. Although the symptoms are distressing, the course is usually favourable within a few days, but severe complications can occur, causing permanent physical or mental damage and, in rare cases, death. Of these two diseases, measles is the more serious [1]. Measles and rubella are all notifiable diseases. Vaccination is the only effective way of preventing these diseases. In the absence of vaccination, they regularly cause epidemics because they are highly contagious. They are transmitted from one person to another by droplets emitted when sneezing, coughing or talking, which remain airborne in enclosed, busy places (schools, public transport, shops, etc.). Each infected person can transmit the virus to others without knowing it, even before falling ill. This can lead to epidemics [1]. According to estimates by the World Health Organisation (WHO), in 2022, the number of cases of rubella will be 49,136, compared with 670,894 cases in 2000, and the number of congenital rubella syndromes reported will be 423, compared with 156 cases in 2000. The WHO estimates that there are 100,000 births with congenital rubella syndrome each year. However, most cases go unreported [2]. Measles is on the rise worldwide, with an increase of 18% by 2022. But the death toll is much higher, up 43% on 2021. This represents 136,000 deaths (mainly in children) for 9 million cases of measles. The rise in measles cases can be explained by the drop in vaccination rates observed in recent years as a result of the Covid19 pandemic [3]. In the Americas, 2023 saw the lowest number of measles cases reported in the last four years. In particular, during epidemiological weeks (SE) 1 and (SE) 42, three countries in the region reported confirmed cases: Canada with 8 cases, Chile with 1 case and the United States of America with 29 cases [4]. Between January and December 2023, 30,601 cases of measles were reported in Europe and Central Asia, compared with 909 for the whole of 2022. This represents a 32.66% increase in the number of cases of this vaccine-preventable disease. The latest data show that around 931,000 children in Europe and Central Asia were totally or partially deprived of routine vaccinations between 2019 and 2021. The vaccination rate for the first dose of measles vaccine has fallen from 96% in 2019 to 93% in 2022 [5]. Africa has been particularly hard hit by the explosion in measles cases due to delays in child vaccination, with an increase of 40.0% in the first three months of 2022 compared with the same period in 2021. Between January and March 2022, nearly 17,500 cases of measles were reported on the continent, with twenty countries reporting measles epidemics, eight more than in 2021 [2]. In the Republic of Guinea, several cases have been recorded and epidemics reported in several regions of the country. In 2017, a total of 7,218 cases of measles were recorded in the Republic of Guinea, including 3,512 cases in the capital Conakry [6]. The study of epidemiology, which focuses on the transmission of diseases within a population, has recently attracted increased interest from researchers in various fields. The severe acute respiratory syndrome (SARS) epidemic in 2003 and the Ebola epidemic in 2014 have led to numerous research studies and publications, most of which have advanced the subject in many areas. In addition, many infectious disease models have been developed to study the dynamic process of epidemics. These models are capable of incorporating realistic aspects of disease spread [7]. This study aims to contribute to surveillance as part of the elimination of measles and rubella in Guinea.

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 of Conakry and at the Medical Biology Analysis Laboratory of the Mahatma Gandhi University. This was a prospective, descriptive, cross-sectional study conducted over a ten-month period from 01 January to 01 November 2024. The study concerned all patients with suspected measles received in the various health facilities in the city of Greater Conakry presenting with fever, cough, rhinorrhoea, maculopapular rash, adenopathy, anorexia, diarrhoea, Köplik's sign, conjunctivitis and oculonasal catarrh during the period of our investigation. All suspected measles cases notified to the various health facilities in the city of Greater Conakry for which adequate and compliant biological samples had been sent to the CRV-LFHVG were included in this study. We carried out exhaustive sampling during our study period. The biological material used was human blood serum. Measles IgM and rubella IgM were our biological variables. Sex, age, residence and vaccination status were our socio-demographic 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 processing and analysis**

The data collected on the survey forms was tabulated, entered, processed and analysed using Word, Excel and Power point software, EPI info from the 2021 office pack. The results are presented in tabular form.

**3. RESULTS AND DISCUSSION**

**Table** 1*: Results of anti-measles immunoglobulin M in measles patients by socio-demographic characteristics.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters  | Numbers | Positive cases | Percentages (%) | 95% CI |
| genders |
| Female 150 76 25,33 20,40 - 30,25 |
| Male 150 68 22,67 17,93 -27,40 |
| Age groups |
| 0 – 10 years 284 142 47,34 41,68 -52,9911 – 20 years 12 1 0,33 -0,31- 0,9721 – 30 years 2 1 0,33 -0,31- 0,9731 – 40 years 1 - - -41 and over 1 - - - |
| Residences |
| Matoto 71 37 12,34 8,61 - 16,04Ratoma 57 34 11,33 7,74 - 14,91Dixinn 52 18 6 3,31 - 8,68Matam 40 18 6 3,31- 8,68Coyah 35 19 6,33 3,57 - 9,08Dubreka 27 16 5,33 2,78 - 7,87Kaloum 18 2 0,67 -0,25 -1,59 |

The F/M sex ratio is 1.

Analysis of this table shows that females appear to be the most affected by measles, with a prevalence of 25.33% with a 95% CI (20.40 - 30.25) compared with 22.67% for males with a 95% CI (17.93 - 27.40). This predominance of females is random, as they are all exposed in the same way. Our results differ from those reported by Ziane et al (2020) in Algeria, who found that males were the most affected, with a measles IgM detection rate of 55.71% compared with 49.29% for females [8].

We also note that almost all age groups were affected by the disease, with a higher rate of IgM detection in the 0-10 age group with 142 cases, i.e. 47.34% 95% CI [41.68 -52.99]. This high prevalence in this age group could be explained by the fact that measles is a childhood disease. The minimum age of recorded cases was 2 months (0.167 years), the mean age was 3 years, and the maximum age was 47 years. Our results differ from those reported by Sy et al. in 2021 in Mali, who found a prevalence of 40.10% in children aged 0-4 years [9].

In relation to their origin, IgM was detected in the sera of patients from all the communes of Greater Conakry. The highest prevalence was observed in patients from the communes of Matoto (12.34%, 95% CI [8.61 - 16.04]) and Ratoma (11.33%, 95% CI [7.74-14.91]), followed by Coyah (6.33%, 95% CI), Dixinn and Matam (6% each). The commune of Kaloum was the least affected by measles, with a detection rate of 0.67%. It also shows that, as the number of suspected measles patients increases, we observe an increase in prevalence. Our results are lower than those reported by Seck et al. in 2022 in Senegal, who found 22.8%, 21.4% and 20.1% of cumulative cases in the Sud, Pikine and Centre districts [10].

**Table 2***: Anti-rubella IgM results in measles-negative samples by socio-demographic characteristics*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters  | Numbers | Positive cases | Percentages (%) | 95% CI |
| Sex |
| Female 74 2 1,28% -0,48 - 3,04 |
| Male 82 2 1,28% -0,48 - 3,04 |
| Age groups |
| 0 – 10 years 142 4 2,57% 0,08-5,0511 – 20 years - - - -21 – 30 years - - - -31 – 40 years - - - -41 and over - - - - |
| Residences |
| Matoto 20 - - - Ratoma 37 1 0,64 -0,61-1,89Dixinn 34 - - - Matam 22 - - - Coyah 16 3 1,92 -0,23-4,07Dubreka 11 - - -Kaloum 16 - - - |

Analysis of this table shows an equal proportion of both sexes, i.e. 1.28% each. This equal proportion is random because the disease is not specific to either the male or female sex. A study carried out by Amadou et al in 2021 in Niger found that 52.8% of men and 47.2% of women were affected [10]. These data do not corroborate those obtained in our study.

Taking into account the age group, we found that of the 156 samples tested negative for measles, anti-rubella IgM was only detected in the sera of patients aged between 0 and 10 years, with a detection rate of 2.57%. Our data differ from those reported by Amadou et al, in 2021, in Niger, who found that rubella was common in all age groups, with a predominance in the 24-59 months (36%) and 5-9 years (33.6%) age groups [11].

We found that anti-rubella immunoglobulin M was only detected in the sera of patients from the communes of Coyah (1.92%) and Ratoma (0.64%), i.e. 3 and 1 cases respectively. These results show that the commune of Coyah is the most affected by rubella. Our results differ from those reported by Amadou et al, in 2021, in Niger, who found that the rubella virus was found in all regions of Niger, with a predominance in the regions of Maradi (28.8%), Tahoua (17%) and Zinder (15.5%) [12].

**Table 3**: *Results of IgM detection in patients vaccinated against measles according to socio-demographic parameters*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters  | Numbers | Positive cases | Percentages (%) | 95% CI |
| Sex |
| Female 27 9 16,98% 6,87- 27,08 |
| Male 26 3 5,66% -0,56 -11,88 |
| Age groups |
| 0 – 10 years 53 12 22,64% 17,90-27,3711 – 20 years - - - -21 – 30 years - - - -31 – 40 years - - - -41 and over - - - - |
| Residences |
| Matoto 16 2 3,77 -1,35-8,89 Ratoma 4 2 3,77 -1,35-8,89Dixinn 1 - - - Matam 15 2 3,77 -1,35-8,89 Coyah 6 3 5,66 -0,56-11,88Dubreka 5 3 5,66 -0,56-11,88Kaloum 6 - - - |

This table shows that, of the 53 subjects vaccinated against measles, IgM was detected in both sexes, with 16.98% of females and 5.66% of males. Although the disease has no gender preference, measles vaccination does not completely prevent infection. This could be due to factors such as the duration of vaccine immunity, vaccine efficacy, or exposure to a different strain of the virus.

We also note that, of the 53 subjects vaccinated against measles, IgM was detected only in the 0-10 age group, with a prevalence of 22.64%. Given that vaccination is a key tool in the prevention of measles, it is essential to adhere to the vaccination schedule and ensure that the vaccine is administered under appropriate conditions, particularly in young children with weak immune systems.

Our results are consistent with those reported by Dia et al (2025) in Senegal, where the majority of suspected cases involve children aged 4 to 6 years (29%). 981 cases (21.4%) were confirmed in the laboratory by an IgM ELISA test. The annual measles confirmation rate was very high during the 2009–2010 period (48.5% for each year) [13].

However, our results contradict those of Dia et al (2025) in Senegal, where the age groups with the highest measles IgM positivity rates were observed in people over 15 years of age with 39.4% (115/292), followed by the 2-3 age group with 30.4% (323/1062) and 30% (148/494) among children under one year of age [13].

We also found that, of the 53 patients vaccinated against measles, IgM was detected in five of the seven communes of Greater Conakry: Dubreka and Coyah were the communes with the highest number of cases, with a prevalence of 5.66% each. Ratoma, Matoto and Dixinn each recorded 2 cases, giving a prevalence rate of 3.77%.

Our results are consistent with those reported by Habibatou et al (2022) in Niger. The female-to-male ratio was 1.1. The 1-5 age group was the most representative (44.44%); 28.3% had received at least one dose of vaccine; 62.22% lived in urban areas.

This highlights the need for enhanced surveillance and vaccination strategies in certain areas to better control the spread of measles.

**Table 4**: *Detection of measles IgM in suspected patients.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N° | Cases  | Numbers | Percentages (%) | 95% CI |
| 1 | IgM Positive | 144 | 48% | **42,32 – 53,65** |
| 2 | IgM Négative | 156 | 52% | 46,34 – 57,65 |
| Total | **300** | **100** | **-** |

Of the 300 samples examined, 144 were positive for measles IgM by the enzyme-linked immunosorbent assay (ELISA), representing a prevalence of 48%, 95% CI [42.32 - 53.65], compared with 52% IgM negative. Our results are lower than those reported by Sy et al (2021) in Mali, who found a prevalence of 68.13% of measles IgM positives [8].

**Table 5**: *Detection of rubella IgM in patients tested negative for measles*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N° | Cases  | Numbers | Percentages (%) | 95% CI |
| 1 | IgM Positive | 4 | 2,57 | 0,08 - 5,05 |
| 2 | IgM Négative | 152 | 97,43 | 94,94 – 99,91 |
| Total | **156** | **100** | **-** |

Looking at this table, we note that among the 156 samples tested negative for measles, 4 were positive for rubella IgM, representing a prevalence of 2.57%, 95% CI [0.08-5.05] compared with 97.43%, 95% CI [94.94-99.91]. Our results are lower than those reported by Amadou et al, in 2021, in Niger, who found a prevalence of 7% of rubella positive cases [11].

**Table 6**: *Vaccination status of patients vaccinated against measles*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N° | Vaccinated | Numbers | Percentages (%)  | IC95% |
| 1 | Yes | 53 | 18 | 13,65-22,34 |
| 2 | No | 153 | 51 | 45,34-56,65 |
| 3 | Unknown | 94 | 31 | 25,76-36,23 |
| Total | **300** | **100** | **-** |

Analysis of this table shows that, of the 300 patients in our study, 53 had been vaccinated (18%), 153 had not (51%), and 94 had unknown vaccination status (31%). We note that the unvaccinated have more than half the prevalence than the sum of those vaccinated and those with unknown vaccination status. This high prevalence of non-vaccination is explained by the inadequacy of measles vaccination campaigns. Hence the need to raise awareness of the need to fully vaccinate children.

Our results corroborate those reported by Zemane, in 2024 in Burkina Faso, who reported that 12.87% of patients were vaccinated against measles, 58.27% were not and 28.86% had unknown vaccination status [14].

**Table 7**: *IgM detection in patients vaccinated*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N° | Cases  | Numbers | Percentages (%) | 95% CI |
| 1 | Positive | 12 | 22,64 | 17,90 - 27,37 |
| 2 | Negative | 39 | 73,58 | 68,59 - 78,56 |
| 3 | Undetermined | 3 | 5,66 | 3,04 - 8,27 |
| Total | **53** | **100** | **-** |

The table shows that of the 53 patients vaccinated, 12 were positive, 3 undetermined, and 39 negative for measles immunoglobulin M, i.e. 22.64%, 73.58% and 5.66% respectively. These results show a high prevalence of 22.64% among subjects vaccinated against measles, indicating that the vaccines taken by these patients are not 100% effective and do not guarantee total immunity.

**4. Conclusion:**

The study revealed that of all the samples analysed, almost half were positive for measles IgM, indicating a high prevalence of the disease. Females were the most affected. Children aged 0-10 years were the most affected. Positive cases were recorded in several communes of Conakry, including Matoto, Ratoma and Coyah. Some of the measles-negative samples were positive for rubella IgM, confirming the presence of rubella in some patients, particularly young children in the communes of Coyah and Ratoma. As far as vaccination was concerned, some patients had been vaccinated, others had not, while for some the vaccination status remained unknown. Even among vaccinated patients, some developed measles. Measles and rubella therefore represent a real public health issue in Guinea, requiring ongoing monitoring of IgM and IgG.

**Consent**

Consent was obtained after explaining to the patients the benefits and constraints associated with portage, in their usual language (Poular, Malinké, Sousou, etc.), while respecting patient confidentiality and anonymity.

**Ethical considerations**

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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