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Rubella Immunity among Pregnant Women in Bangui, Central African Republic

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Abstract

Sero-positivity rates of the rubella virus among pregnant women vary from country to country widely throughout the world. In the Central African Republic, rubella vaccination is not included in the national immunization schedule. Thus, we propose to evaluate the immune status of pregnant women. This was an analytical retrospective study that consulted the records of pregnant women received in prenatal consultations at the Bangui Community Hospital maternity ward from January to December 2020. Socio-demographic and laboratory data (IgM, IgG) were collected from January to June 2021. Chi^2 test was used. A total of 289 pregnant women were analyzed. Women with an IgM+ response accounted for 4.15%. Those with an IgG+ were 14.87%. The distribution by age group shows that patients aged 20 - 24 and those aged 25 - 29 had a rubella profile suggesting persistent infection ($p = 0.010$). The average age of women included was 28 (±6) years. The average parity for the entire sample was 2.18 (1.93). At any age pregnant women were not significantly exposed to rubella infection ($p = 0.96$), (ORbrut = 1.03; CI95% = [0.32 - 3.34]). Both immunized and non-immunized individuals are similarly exposed [OR = 0.86; 95% IC95% = 0.44 - 1.68] with no difference ($p = 0.96$). Rubella infection remains particularly severe when it occurs during pregnancy. It would be wise to seek immunity in all girls of childbearing age in order to rule out any risk of rubella embryopathy.

Keywords

Rubella Immunity, Pregnant Women, Central African Republic

1. Introduction

Rubella, a contagious viral infection that is generally mild, most often affects

children and young adults, except when it occurs during pregnancy [1]. Transmission is strictly interhuman (saliva droplets emitted by people infected during coughing or sneezing) and man is the only reservoir of the rubella virus. In pregnant women, mother-to-child transmission of the virus occurs through the placenta and can lead to rubella embryopathy. Rubella virus infection is particularly severe in primary maternal infection during the first trimester of pregnancy [2]. The main manifestations are intrauterine stunting, abortion [3] [4] [5]. The severity of infection varies with the age of pregnancy [6]. Infection with these viruses is immunizing and pre-pregnancy contamination is in principle protective against these congenital risks [7]. The development of sero-diagnostic and vaccination methods is currently making it possible to confirm the diagnosis, to detect inappropriate infections and to judge the advisability of individual and collective vaccination. In the Central African Republic, although the combined measles, mumps and rubella (MMR) vaccine is recommended, its introduction is not yet effective in the country. It is in this context that we propose to evaluate the immune status of pregnant women towards rubella in order to have updated data for an effective prevention strategy.

2. Materials and Method

2.1. Study Design

This was an analytical retrospective study that consulted the records of pregnant women who received prenatal consultations (PNC) at the Bangui Community Hospital maternity ward from January to December 2020. Data was collected from January to June 2021 on the basis of the consultation and the laboratory register.

2.2. Data Collection

The data collected concerned: 1) socio-demographic characteristics which included at the time of the PNC: age, number of children born alive (parity), place of residence (urban and semi-urban areas), 2) serological status and reaction title, 3) the laboratory analysis method for the determination of anti-rubella IgG and IgM antibodies using the Combs enzyme immunoassay with sensitivity and specificity of 93.3% and 100% respectively. The proportion of patients immunized was calculated as the number of pregnant women immunized divided by the total number of women tested. This proportion will be determined per 100 pregnant women.

2.3. Statistical Analysis

The data was collected using a laboratory register using a collection sheet and entered on an Excel 2010 file and analyzed with Epi-info 7© from CDC Atlanta and SPSS version 22. Measurements of central trend and dispersion were determined for age with a 95% confidence interval. The χ^2 test was used to compare the two proportions. The search for an association between the variables of the

study namely; 1) socio-demographic variables (age, parity, place of residence), biological variables (IgM, IgG) and the occurrence of rubella was done by logistic regression in multivariate analysis. The Odd ratios (ORs) were calculated as well as their confidence intervals, IC95%. For a p-value < 0.05, the Odd ratio value favoured a statistically significant association.

3. Results

3.1. Characteristic of Patients

A total of 289 pregnant women were tested. Seroprevalence of rubella infection was 12.46%. The average age of pregnant women included was 28 (± 6) years. The average parity for the entire sample was 2.18 (± 1.93). Similarly, the distribution of study subjects between semi-urban and urban areas was statistically similar (p > 0.05) as shown in Table 1.

3.2. Distribution of Antibody Responses According to the Variables Studied

Women with positive IgM responses accounted for 4.15% or n = 12/289. Women with positive IgG responses accounted for 14.87% or n = 43/289. The distribution by age group shows that patients aged 20 - 24 and those aged 25 - 29 had a rubella profile suggesting probable ongoing infection (p = 0.010). Similarly, this same age group was numerous in developing IgG antibody responses to the

Table 1. Sociodemographic and laboratory characteristics of patients.

Variables	N = 289 (%)	p-value
Age (years), mean of age (SD) = 28 (±6)		**0.015**
14 - 19	28 (9.7)	
20 - 24	70 (24.22)	
25 - 29	74 (25.6)	
30 - 34	93 (32.18)	
35 - 44	24 (8.3)	
Parity, mean of parity = 2.18 (±1.93)		
Nulliparous	73 (25.26)	
Pauciparous	119 (41.18)	
Multiparous	97 (33.56)	
Rubellaserology		**0.018**
positive	12 (4.15)	
negative	277 (95.85)	
Residence		**0.25**
Urban	233 (80.62)	
semi urban	56 (19.38)	

disease with a statistically different age group (p = 0.018). According to parity, the poor were more represented without any statistically significant difference (p = 0.23) as shown in Table 2.

3.3. Association between Rubella Status and Study Variables

Of the samples studied, at any age pregnant women were not significantly exposed to rubella infection (p = 0.96), ORbrut = 1.03; CI95% = [0.32 - 3.34]. Similarly, depending on the immune status of women, both immunized and non-immunized individuals are similarly exposed [OR = 0.86; CI95% = 0.44 - 1.68] with no statistically positive difference (p = 0.96) and 19.04% of women with positive antirubeolal response had protective levels. Women tend to be not significantly exposed to rubella infection depending on the number of pregnancies contracted [OR = 1.48 CI95% 0.84 - 1.99] as shown in Table 3.

4. Discussion

Rubella infection during pregnancy can be the cause of embryopathy which is the consequence of a benign condition difficult to diagnose in its abortive or atypical forms without eruption and which are contagious. In our study, the majority of patients lived in urban areas with no difference between the areas. Indeed, geographic location is an important factor influencing the epidemiological variations and immune status of people infected with rubella, as already reported in some studies [7]. Indeed, the best social conditions were already reported by some authors as low risk factors for acquiring rubella [8]. During this work, pregnant women aged 20 to 24 years and those aged 25 to 29 years developed IgG antibody responses against the disease with a statistically different age range (p = 0.018). Our results corroborate those of some authors [9] [10] and may, however, be explained because the diagnosis of rubella is part of the

Table 2. Distribution of antibody responses according to the variables studied.

Variables Effect	Antibody responses				p-value
	IgM+ n (%)	IgM- n (%)	IgG+ n (%)	IgG- n (%)	
age range (years)					**0.44**
14 - 19	1 (8.34)	30 (10.8)	2(4.65)	27 (10.98)	
20 - 24	5 (41.66)	56 (20.22)	21 (48.84)	56 (22.74)	
25 - 29	3 (25)	72 (25.99)	16 (37.21)	59 (23.93)	
30 - 34	2 (16.66)	99 (35.74)	2 (4.65)	87 (35.36)	
35 - 44	1 (8.34)	20 (7.25)	2 (4.65)	17 (6.99)	
Parity					**0.23**
Nulliparous	2 (1.66)	77 (27.79)	9 (20.94)	55 (22.35)	
Pauciparous	7 (58.34)	108 (38.98)	23 (53.48)	93 (37.8)	
Multiparous	3 (25)	92 (33.23)	11 (25.58)	98 (39.85)	

Table 3. Bivariate analysis between rubella status and study variables.

Variables Effect	Rubella status		ORbrut	CI95%	p-value
	Rubella + n = 12 (%)	Rubella- n = 277 (%)			
Age			1.03	[0.32 – 3.34]	**0.95**
14 - 19	1 (8.34)	24 (8.66)			
20 - 24	5 (41.66)	64 (23.11)			
25 - 29	3 (25)	69 (24.91)			
30 - 34	2 (16.66)	97 (35.01)			
35 - 44	1 (8.34)	23 (8.31)			
Immune status					
Immunized	55 (19.04)		0.86	[0.44 - 1.68]	**0.66**
No Immunized	234 (80.96)				
Parity				1.4 [0.84 - 1.99]	
Nulliparous	2 (1.,66)	77 (27.79)			
Pauciparous	7 (58.34)	108 (38.98)			
Multiparous	3 (25)	92 (33.23)			

systematic prenatal assessment in pregnant women. However, 95.85% of pregnant women had IgG-negative serology and were therefore susceptible to the virus. In addition, 4.15% of our subjects were at risk of contracting the infection during pregnancy. These same findings were already made by some authors in Kenya who reported a 7% risk of primary infection in pregnant women [10]. This is likely due to the lack of vaccination coverage for rubella in the country [11]. This primary infection could give these pregnant women protective immunity but can be serious for the fetus with risk of rubella embryopathy [12]. This would imply that the spread of the virus would regress without disappearing in these women because of the persistent antibody titres that consolidate immunity against this disease. This persistence of the virus maintains a level of immunity that would prevent an outbreak. However, it would be wise to monitor the level of community protection through serological surveys. In addition, at the individual level it will be useful to seek immunity in all girls of reproductive age in order to eliminate any risk of rubella embryopathy. However, it would be wise to explore several successive serologies and assess for women with positive IgM serology the stage of pregnancy that has an impact on the risk of transmission to the fetus. Since these data are not available at the time of the study, this constitutes a limit to this work.

5. Conclusion

Rubella infection remains particularly serious when it occurs during pregnancy. Patients aged 20 - 24 and those aged 25 - 29 had a rubella profile suggesting per-

sistent infection. Thus, it would be advisable to monitor the degree of protection of the community and to seek immunity in all girls of childbearing age in order to eliminate any risk of rubella embryopathy by setting up a specific prevention program.

Authors' Contributions

WSN conceived, designed, conducted the experiments, analyzed the data and prepared the manuscript. **JON** read and approved the final manuscript. **GA** collected the data and **REKL** read and approved the final manuscript.

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Institutional Review Board Statement

This study protocol received full approval from the local Ethics committee of Health Science Faculty of University of Bangui and was conducted in compliance with the declaration of Helsinki. Approval reference number 18/FACSS/CES/21.

Data Availability Statement

Data is contained within the article.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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