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Rubella-specific IgG antibodies in non-pregnant women in Rivers State, Nigeria

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Abstract

Background: Rubella is a contagious virus-borne disease. The study aimed to test a cohort of non-pregnant women in Rivers State for rubella virus IgG antibodies and identify their susceptibility to the viral infection.

Methods: The study included 92 consenting non-pregnant women attending Rivers State University Teaching Hospital in Rivers State. The sera were evaluated for detectable anti-rubella IgG antibodies using ELISA kits according to the manufacturer's instructions.

Results: Eighty-five (92.4 per cent) of the 92 samples tested positive for rubella Immunoglobulin G antibodies, while 7 (7.6 per cent) tested negative. Rubella IgG seroprevalence was unrelated to age, education, or occupation.

Conclusion: Given the high level of rubella IgG among non-pregnant women tested in Rivers State, it is likely that the virus is prevalent in the research area. As a result, a robust surveillance system and the organization of screening for anti-rubella IgG antibodies in pregnant women would be critical for future protection against the illness.

Keywords: Antibodies; IgG; Rubella Virus; Non-pregnant women; Nigeria

1. Introduction

Rubella infection is frequently mild and self-limiting in adults and children, making it a harmless illness. In adults, a prominent, 1-4 mm-wide rose-pink maculopapular rash induced by rubella exanthema can be highly irritating (Giridhar, 2006). Although some women who have had rubella experience arthritis in their fingers, wrists, and knees for about a month, it has been discovered that exposure to the disease provides permanent protection. In rare cases, rubella may cause ear infections or brain inflammation (Junaid et al., 2011). It causes congenital rubella syndrome, which primarily affects pregnant women during their first trimester and negatively influences the developing fetus.

The syndrome (CRS), which includes cardiac, cerebral, ophthalmic, and auditory problems, occurs following prenatal Rubella virus infection (Atreya et al., 2004; Kolawole et al., 2014).

Rubella, a minor illness with global distribution, causes symptoms such as a low-grade fever, a sore throat, a rash that begins on the face and gradually spreads to the rest of the body (Onyiloje et al., 2014). The rubella virus has a prevalence of seropositivity ranging from 66 to 99 per cent in sub-Saharan Africa (Goodson et al., 2011). Even when rubella vaccination is sparse, susceptibility to rubella among women of reproductive age in developing countries is low. However, because the rubella virus spreads in newborns, only a small number of women are at risk of getting a primary infection (Bouhtry et al., 2014).

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Detecting the rubella virus is required in prosperous countries to evaluate the health of unborn infants and to understand the infection's prevalence, which varies substantially between countries (Tulu et al., 2018). A high level of community immunity is required to avoid rubella and congenital rubella syndrome (CRS) (Gilbert et al., 2017). A natural induced immunity develops after being exposed to a rubella virus. The serological test using ELISA, recognized as an effective, sensitive, and reliable diagnostic technique, is essential for measuring rubella-specific IgG and IgM (Okonko et al., 2020). The presence of immunoglobulin G (IgG) antibodies in the serum indicates immunity against rubella. Although the level of IgG considered protective varies by nation, rubella IgG antibodies 10 IU/ml are commonly considered protective (WHO, 2011).

Despite the lack of a national incidence figure, rubella endemicity has been established and documented in numerous Nigerian regions (Adim et al., 2020). Women of childbearing age who resist rubella may be at risk of acquiring CRS indirectly (Gupta et al., 2015). There is no scientific data on the seroprevalence of rubella IgG antibodies in non-pregnant women in Rivers State and its environs.

As a result, the study aimed to determine the seroprevalence of anti-rubella IgG in non-pregnant women visiting a tertiary health facility in Rivers State, Nigeria. Also, to generate baseline data that can catalyze for relevant health authorities to recognize the need for formulating workable, implementable policies to mitigate the sequelae of rubella virus infection, throughout the country.

2. Methodology

2.1. Study Design

A cross-sectional study on non-pregnant women was undertaken at the Rivers State University Teaching Hospital (RSUTH) in Rivers State. The Rivers State Health Research Ethics Committee approved the study on ethical grounds. Before collecting samples, willing non-pregnant women were given a standardized questionnaire to acquire information on socio-demographic variables.

2.2. Subjects, Samples Collection and Processing

The Rivers State University Teaching Hospital (RSUTH) in Rivers State conducted a cross-sectional study on non-pregnant women. Before collecting samples, willing non-pregnant women were randomly assigned a standardized questionnaire to collect socio-demographic information. The Rivers State Health Research Ethics Committee accepted the study on ethical grounds.

2.3. Analysis of Blood Samples

The Department of Microbiology conducted the laboratory analysis at the University of Port Harcourt in Choba, Rivers State. The samples were tested for IgG antibodies to the rubella virus using a commercially available ELISA kit manufactured by DIA.PRO Diagnostic Bioprobes Srl Via G. Carducci no. 27 20099 Sesto San Giovanni (Milano), Italy. The microplates were washed in the automated washer (Biotek ELx 50, USA). The coloured reaction result was measured using a spectrophotometric plate reader (Biotek ELx808i, USA) with an absorbance range of 450-630 nm. The manufacturer's instructions were followed for each stage of the ELISA assays.

After standardizing the equipment according to the manufacturer's recommendations, a concentration of 10 IU/ml was used to differentiate between the negative and positive samples. Samples exhibiting an anti-Rubella Virus IgG antibody concentration more than or equal to 10 WHO IU/ml were considered positive (Kolawole et al., 2014). If the concentration of anti-Rubella Virus IgG antibodies in a sample was less than 10 WHO IU/ml, it was considered non-reactive (Dia Pro. Diagnostic BioprobesSrl).

2.4. Data Analysis

The information acquired from lab testing and questionnaires was analyzed using the Statistical Package for Social Sciences version 21. Pearson Chi-square was calculated at a 95 percent confidence level to determine the relationship between the presence of viral antibodies and other parameters, and a P-value of 0.05 was considered significant (Araoye, 2004; Olajide et al., 2015).

3. Results

Out of 92 non-pregnant women's serum tested for rubella IgG antibody, 85 (92.4%) were positive, and 7 (7.6%) were negative, as depicted in Figure 1.

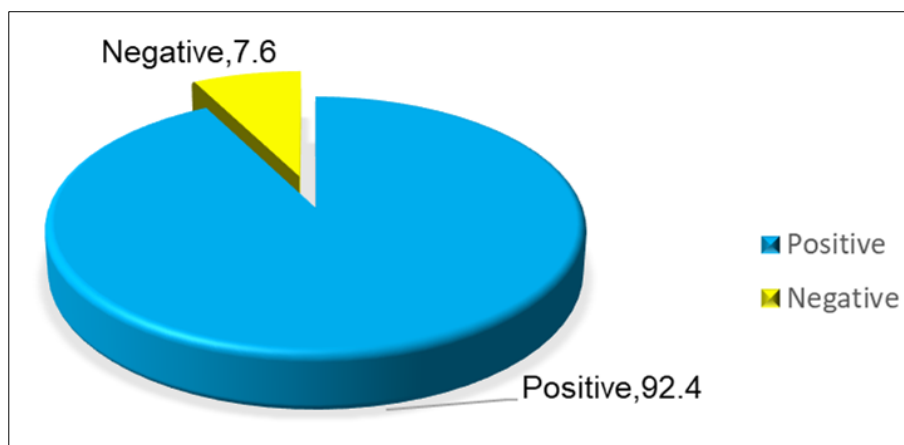


Figure 1 Rate of Rubella IgG seropositivity and seronegativity among non-pregnant women

Table 1 shows the prevalence of rubella IgG antibodies in non-pregnant women of various ages. Seroprevalence was higher (94.9 per cent) among women aged 30-39. Seroprevalence rates in the age categories 10-19years and 20-29years were 80% and 91.4 per cent, respectively. The twelve women over 40 who tested positive had a prevalence rate of 92.3 per cent. However, there was no statistically significant variation in prevalence rates between age groups ($P = 0.648$).

Table 1 Prevalence of rubella IgG antibodies among non-pregnant women according to age group

Age Group	No. Analyzed (%)	No. Positive (%)	P Value
10 - 19	5	4 (80.0)	0.648
20 - 29	35	32 (91.4)	
30 - 39	39	37 (94.9)	
≥40	13	12 (92.3)	
Total	92	85	

In terms of education, non-pregnant women with a primary level of education had the highest frequency (100%). In comparison, those with a secondary level of education had the lowest prevalence (90.0%). There was no statistically significant variation in seropositivity rates based on schooling ($P = 0.373$).

Table 2 Prevalence of rubella IgG antibodies among non-pregnant women according to Level of Education

Education Level	No. Analyzed (%)	No. Positive (%)	P Value
Primary	19	19 (100)	0.373
Secondary	10	9 (90.0)	
Tertiary	63	57 (90.5)	
Total	92	85	

Non-pregnant women with an elementary level of education had the highest frequency (100%), while those with a secondary level of education had the lowest incidence (90.0 per cent). Schooling had no statistically significant effect on seropositivity rates ($P = 0.373$).

Table 3 Prevalence of rubella IgG antibodies among non-pregnant women according to Occupation

Occupation	No Analyzed (%)	No positive (%)	P Value
Civil servant	42	39 (92.9)	0.770
Student	25	23 (92.0)	
Housewives	7	7 (100.0)	
Trader	14	12 (85.7)	
Self-employed	4	4 (100.0)	
Total	92	85 (92.4)	

4. Discussion

In this study, non-pregnant women in Rivers State were evaluated for IgG seroprevalence of the rubella virus. The results showed a high seroprevalence rate of 92.4 per cent, consistent with reports of circulating rubella antibodies in other parts of the world (Gupta et al., 2015). According to a European study, European women (93.2 per cent) had a higher prevalence of rubella immunity than African (86.7 per cent) and Asian (86.4 per cent) women (Gupta et al., 2015).

Gupta et al. reported a 42.2 per cent prevalence in India, which was far lower than the seroprevalence rate in this study, which was much higher (2015). Furthermore, it was higher than that reported by Abdolreza et al. (2011) and Al-Mishaddani and Al-Janabi (2008), who found IgG seroprevalence to be 82% and 82.7 per cent, respectively.

The high seropositivity rate shows that more women have been exposed to the rubella virus. This is more likely due to their initial virus exposure and subsequent reinfection than to rubella vaccination, given that most of the women examined were ignorant of the rubella vaccine, most likely because it is not included in Nigeria's regular immunization program (Adesina et al., 2008).

Rubella IgG seroprevalence did not differ significantly by age group; the lowest rate (80.0 per cent) was found in women under the age of 20, followed by a rate of 91.4 per cent in women aged 20 to 29, and the highest rate (94.9 per cent) was found in women aged 30 to 39. According to the study, women between 30 and 39 had the most robust serological protection. Seropositivity increases with age, according to researchers Singla et al., 2004; Nessa et al., 2008; and Gupta et al., 2015. According to Hassan et al., this tendency differed from that observed in other Moroccan and Iraqi locations (2016). Caidi & colleagues (2009) reported that the highest seropositivity was identified in the age group of >40 years in an Oyo State investigation, while the lowest rate, in the age range of 20-29 years, revealed a decreasing seroprevalence of rubella IgG antibodies as age increases (Adesina et al., 2008). The seroprevalence of rubella infection rose with age in our study, showing that the population has been exposed consistently to the rubella virus (Nessa et al., 2008).

Women with primary education had highest seroprevalence (100%) compared to those with secondary (90%) and higher (90.5%) education. This could be due to their low socioeconomic situation and education level. This finding was reached despite indications that women with tertiary education had the highest seropositivity (Hassan, 2011, Hassan et al., 2016). The findings of this study, which were consistent with those of other studies, suggested that the educational status of non-pregnant women was an insignificant risk factor (Hassan, 2011). Women would benefit from the motivation of health education that recognizes the risks of rubella infection to reduce the illness's burden.

When the occupation was considered, non-pregnant women who are self-employed or homemakers had the highest prevalence rates of anti-rubella IgG antibodies—exposure to crowded environments with less affluent socioeconomic conditions (Ganjooie & Mohammadi, 2003).

5. Conclusion

According to this study, a significant minority of non-pregnant women in Rivers State are at risk of acute rubella virus infections due to a large percentage of them having protective rubella antibodies. This demonstrates how ubiquitous the virus is in the study area. Educating women and developing screening and immunization programs to avoid sickness in the state is critical.

Compliance with ethical standards

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Disclosure of conflict of interest

Authors have declared that no competing interests exist.

Statement of informed consent

The Hospital Ethical Committee of Rivers State University Teaching Hospital (RSUTH) approved this study. The purpose and procedures of this study were explained to pregnant women. Participation in this study was voluntary, and informed consents were gotten from all participants included in the study.

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