Prevalence of Rubella Immunity among Women Seeking Antenatal Care in a Tertiary Institution, South-South, Nigeria

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Authors' contributions

Article Information

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ABSTRACT

Aims: To determine rubella sero-prevalence (IgG, IgM) and to describe its relation to socio-demographic data among pregnant women in a tertiary institution in Yenagoa, Bayelsa state, South-South, Nigeria.

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Study Design: This was a descriptive cross sectional study.

Place and Duration of Study: Department of Obstetrics and Gynaecology, Federal Medical Centre in Yenegoa, Bayelsa State, in South-South Nigeria between May 2020 and August 2020.

Methodology: We included 398 women at various stages of pregnancy. An interviewer administered questionnaire was used to obtain socio demographic data. Ten ml of venous blood was then collected for serological assays. Analyses of samples were done using an in-vitro on-site rubella IgG/IgM rapid diagnostic assay. P value were kept at 0.05.

Results: A total of 209 (53.0%) of the 398 women had a positive IgG antibodies. None (0.0%) of the women had positive IgM antibodies. There were no significant associations between respondents socio-demographic characteristics and rubella immunity as the probability values observed were greater than 0.05 (p>0.05).

Conclusion: Our study shows a moderately high sero-prevalence of IgG antibodies amongst the participants studied. This indicates that rubella infection is endemic in Nigeria and requires further surveillance and control.

1. INTRODUCTION

Nearly 100,000 cases of congenital rubella syndrome are seen yearly throughout the world. This makes it an important pathogen of global and public health concern [1-3]. Adverse outcomes of rubella infection during pregnancy include miscarriage, prematurity, intrauterine fetal death, growth retardation, and congenital rubella syndrome (CRS) [4]. The congenital Rubella Syndrome is characterized by a constellation of fetal anomalies such as mental retardation, brain damage such as microcephaly, heart defects, cataracts, blindness, deafness, hepatomegaly and jaundice [4]. Rubella is composed of a single stranded ribonucleic acid (RNA) surrounded by lipid membrane and belongs to the family of viruses known as Togaviridae. Although vaccination has reduced its incidence in developed countries, it is still a major concern in developing countries like Nigeria with low immunization coverage [5]. World Health Organization (WHO) advises countries with no National Rubella vaccination schedules to carry out continuous sero-epidemiological surveillance of rubella and CRS [6-8]. Serology is the main stay of laboratory diagnosis which includes detecting immunoglobulin M (IgM) for acute infections and immunoglobulin G (IgG) for past infection. Sero-prevalence of rubella infection differs widely between various countries [9-10]. Previous rubella studies in Africa have documented IgG sero-prevalence ranging from 52.9% to 97.9%, and IgM ranging from 2.1% to 47.1% [6]. Berno Mwambe et al found a sero-positivity of 92.6% and 0.3% of IgG and IgM respectively amongst pregnant women in Tanzania [7]. This is quite a contrast to studies by Okikiola et al. who found

38.8% and 93.1% of IgG and IgM in Nigeria and Bukbuk who found IgG sero-prevalence of 54.1% in Maidugiri, nigeria [11,12]. There are few studies of rubella prevalence in South- South Nigeria.

We therefor set out to determine the sero-prevance of rubella antibodies and any related factors amongst pregnant women attending the antenatal clinic in Federal Medical Centre.
This serves as a baseline study to assist policy makers in the control of rubella in our region.

2. MATERIALS AND METHODS

2.1 Study Settings

This study was done at the Federal Medical Centre (FMC) Yenagoa, Bayelsa, South-South Nigeria. FMC serves both primary and referral hospital services to Bayelsa and adjourning states such as Delta, Rivers, and Imo sates. Bayelsa is the southern-most part of Nigeria with a population of 2,277,961 people.

2.2 Design and population

We conducted a descriptive cross-sectional study of women attending the antenatal clinics of the Federal Medical Centre between the months of May to August, 2020**.** The study population consisted of 398 women at various stages of pregnancy. Each participant who agreed to participate, signed an informed consent and then completed a questionnaire. The questionnaire included socio-demographic information and possible risk factors for rubella acquisition. The reliability of the structured questionnaire was

measured using Cronbach alpha statistics amongst 50 pregnant women and found to be greater than 75% [13].

2.3 Sample Collection and Analysis

Ten ml of blood were collected from each participant by the investigator through venipuncture. Obtained samples were centrifuged at 300 rpm for ten minutes and serum was obtained. Serum was then used for IgM and IgG analyses immediately or transported to the Federal Medical Centre Pathology research laboratory for storage at -20 degree centigrade prior to usage. Analyses of samples were done using an in-vitro on-site rubella IgG/IgM rapid diagnostic assay kits (Innovation Biotech (Beijing) Co. CTK Biotech 2019) according to the manufacturer's standard procedures.

2.4 Data Analysis

Statistical data were collected and entered into a spread-sheet. Calculations were done using SPSS 23.0 for windows$^®$ statistical software [14]. The association between the characteristics of the women and rubella sero-positivity were calculated using bivariate and multivariate analyses. For comparisons of the sero-positive frequencies within groups, the Pearson's Chi-square and the Fisher exact test (when values were less than 5) were used. A *p*-value of <0.05 were considered statistically significant.

3. RESULTS AND DISCUSSION

The goal of this study was to determine the sero-prevalence of rubella and any contributing socio demographic factors during pregnancy. Of the 398 pregnant women sampled, 209 (53%) had positive IgG antibodies, and none (0%) had positive IgM antibodies in their serum, as shown in Table 1.

The socio-demographic characteristics of the respondents are shown in Table 2. The mean age of the respondents is 31.25 years (standard deviation: 4.02 years.) and the median age is 35 years.

Most of the participants (71.1%) were between the ages of 30-39 years, 25% were between 20-29 years, and 3.5% were between 40-49 years.

Most of the respondents have tertiary education, are married, work (civil servants), and are of Ijaw

ethnic origin of the Niger Delta part of Nigeria. It is of note, the majority of the women were multiparous (66.7%) and are at a gestational ages of less than 37 weeks (88.4%).

The association between the socio-demographic characteristics and rubella infection is shown in Table 3.
Bivariate logistic regression shows that there was no significant association observed between respondents socio-demographic characteristics and Rubella infection as the probability values observed were greater than 0.05 (p>0.05) as shown In table 3.

Further consideration of Table 3, shows that marital status is more likely to be associated with rubella immunity.

4. DISCUSSION

The results of this study showed a moderately high sero-prevalence rate of IgG (53%) among the pregnant women attending the antenatal clinics of the Federal Medical Centre Yenagoa with all participants being sero-negative of IgM.

The prevalence of IgG antibodies suggest that just over half of the pregnant women surveyed had previously been exposed to rubella in the past. Immunity to rubella could be due to natural immunity (B-Cell memory) or vaccination [6,15,16]. Although rubella vaccination is not included in Nigeria's National Programme on Immunization, this vaccine is available in private health facilities at prices above the reach of the majority of our pregnant women [11,16,17] For this reason, the rubella sero-positivity in our study population is most likely a result of natural immunity.

Most of the women surveyed have secondary or tertiary education and are employed in civil service and other business. Although there was no significant association between rubella IgG acquisition and socio-demographic variables in this survey, it has been shown that populations with higher education and incomes can easily acquire high cost immunizations compared to less educated and lower income populace [18-19].

Our survey shows an equal prevalence of rubella antibodies in participants whose ages are greater than 30 years and those with greater gestational age. This contrasts the report by Berno Mwambe et al who noted greater sero-positivity with

increasing age (with an increase of 12% per year) and with increasing gestational age [7].

This study also shows equal sero-positivity of rubella virus in participants with higher education. This result is in disagreement with other studies which shows that women with lower educational status tend to have higher prevalence of rubella virus, possibly due to less awareness of rubella preventive measures [12,20]. Possible speculation for this difference from our study could be due to greater exposure to the virus associated with increased mobility, travels and exposure as awareness increases.

The results also demonstrate that all the affected women have developed immunity to the virus as evidenced by the participants being sero-negative to IgM antibodies. IgM antibodies is a marker of acute infection and tends to wane as the infection become chronic [21-22]. This also insinuates that the women have been exposed in the past and have developed immunity to rubella infection.

The 53% IgG sero-prevalence rate is consistent with similar results reported by Onakewhor et al in Benin, who also reported a sero-prevalence rate of 53% [16]. This finding is also consistent with similar reports of 54.1%, and 51% reported in other parts of Nigeria by Bukbuk et al' in Maidugiri and Agbede et al in Ilorin [12,23]. Higher IgG sero-prevalence of 90.2%,and 97.9%, have been reported by AIshatu et al and Mohammed et al, both from Zaria respectively [17,24]. Outside Nigeria, high IgG sero-prevalence of 92.6%, 85%, 79.5% and 95% have been reported by Berno Mwambe et al, Salou Mounerou et al, Yitayih Wondimeneh et al and Marc C. Tahita et al in Tanzania, Togo, Ethiopia, and Burkina Faso respectively [7,25,26,27].

Our IgM seropositivity of 0.0% is consistent with a report by Rishikeshav Acharya et al in Nepal [28]. However our IgM seroposivity differs from other parts of Nigeria and other parts of Africa where higher IgM seropositivity have been reported [11,16,23,29].

A systematic review of rubella sero-prevalence of 36 articles from 17 countries in Africa from 2002 to 2012 shows that natural immunity to rubella (IgG) amongst pregnant women ranges from 57.9% to 97.9% and the sero-prevalence of susceptible pregnant women (IgM) ranges from 2.1% to 47.1% [6]. Possible speculation to differences in IgM sero-prevalence attributes to difference in climate and environmental conditions. There is also the speculations that different populations may show differing immune response to the same pathogens [30].

To the best of our knowledge, no studies have previously examined the sero-prevalence and socio demographic factors associated with rubella immunity among pregnant women in Yenagoa, Nigeria. This study therefore serves as baseline information on rubella in Bayelsa, South-South, Nigeria. Our study also shed light on existing knowledge about rubella immunity in Nigeria. The findings are also likely to have practical application regarding the knowledge, and attitude towards and prevention of rubella infection among pregnant women in our region.

Practical ways to prevent rubella in pregnancy include: (1) Introduction of MMR (Measles, Mumps and Rubella) vaccination into our National Programme on immunization. (2) Report and investigate cases of suspected congenital rubella syndrome in new born and infants promptly, as required by the national communicable disease surveillance system. (3) Formulation of strategies necessary for health education, management and surveillance of rubella infection among women of child bearing ages in antenatal clinics and in the community (Integrated management) [31]. (4) Strengthening the clinical laboratories for accurate routine diagnosis of rubella infection amongst antenatal attendees.

Table 1. Prevalence of IgM/IgG antibodies amongst participants (*n=398*)

Characteristics	Frequency (n)	Percentage (%)
Rubella IgM status		
Positive	0	0.0
Negative	398	0.0
Rubella IgG status		
Positive	209	52.51
Negative	189	47.49

Table 2. Socio-demographic Data (n=398)

Characteristics	Frequency (n)	Percentage (%)
Age		
20-29	101	25.38
30-39	283	71.11
40-49	14	3.52
Mean ± SD: 31.25 ± 4.02 years		
Educational Level		
Primary	5	1.26
Secondary	112	28.14
Tertiary	281	70.60
Religion		
Christian	393	98.74
Islam	5	1.26
Marital Status		
Married	393	98.74
Single	5	1.26
Ethnicity		
Ijaw	230	57.79
Igbo	52	13.07
Efik/Ibibio	24	6.03
Urobo	22	5.53
Epie	13	3.27
Ikwerre	9	2.26
Isoko	9	2.26
Yoruba	9	2.26
Edo	5	1.26
Hausa	5	1.26
Idoma	5	1.26
Igala	5	1.26
Brass	5	1.26
Itsekiri	5	1.26
Occupation		
Civil servant	172	43.22
Business/Trading	149	37.44
Professional	23	5.78
Student	17	4.27
Housewife	5	1.26
Clergy	4	1.01
Unemployed	28	7.04

Table 3. Association between socio-demographic characteristics and rubella immunity

Socio-demographic characteristics	Rubella Infection (IgG)		Total	df	χ^2(p-value)	OR (95% CI)
	Positiven= 209 Freq (%)	Negativen =189 Freq (%)				
Age						
> 30	139 (52.85)	124 (47.15)	263 (100.0)	1	0.01	1.04 (0.68-
≤ 30	70 (5185)	65 (48.15)	135 (100.0)		(0.934)	1.58)
Educational Level						
≤ Secondary	64 (54.70)	53 (45.30)	117 (100.0)	1	0.21	1.13 (0.73-
Tertiary	145 (51.60)	136 (48.40)	281 (100.0)		(0.649)	1.75)
Marital Status						

Socio-demographic characteristics	Rubella Infection (IgG)		Total	df	χ^2(p-value)	OR (95% CI)
	Positiven= 209 Freq (%)	Negativen =189 Freq (%)				
Married	209 (53.18)	184 (46.82)	393 (100.0)	1	3.67 (0.061)	0.0 (0.0-1.36)
Single	0 (0.0)	5 (100.0)	5 (100.0)			
Parity						
Para (≤1)	142 (52.99)	126 (47.01)	268 (100.0)	1	0.027 (0.786)	1.06 (0.69-1.61)
Para (2-5)	67 (51.54)	63 (48.46)	130 (100.0)			
Gestational Age						
Preterm (<37)	183 (51.99)	169 (48.01)	352 (100.0)	1	0.17 (0.673)	1.55
Term (37-42)	26 (56.52)	20 (43.48)	46 (100.0)			

5. CONCLUSION

Our study found a prevalence of rubella immunity of 53% amongst our pregnant women attending antenatal clinic in Yenagoa. This implies that Rubella immunity in pregnancy is prevalent in our environment. Just less than half of the women are not immune to the virus. As such, these non-immune women are at risk of having babies with the dreaded Congenital Rubella Syndrome (CRS). The results also underscore the need for screening and surveillance of rubella amongst pregnant women and women of child bearing age in Nigeria.

CONSENT

As per international standard or University standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical approval for this study was granted by the Ethics Committee of the Federal Medical Centre, Yenagoa, Nigeria with Ethical approval number FMCY/REC/ECC/2020/JULY/252.

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COMPETING INTERESTS

Authors Have Declared That No Competing Interests Exist.

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