

Seroprevalence of Rubella Specific IgG Antibody among Pregnant Women Attending Ante-Natal Clinics in Kaduna Metropolis, Nigeria

*¹H.K. Mangga,²Maryam Aminu and ²H.I. Inabo

¹Department of Microbiology, University of Maiduguri, Maiduguri, Borno State, Nigeria

²Department of Microbiology, Ahmadu Bello University, Zaria, Kaduna State, Nigeria

[†]Correspondence author: mangga4ever@gmail.com; ☎: +2348061615137]

ABSTRACT: Rubella infection is generally mild in children. However, infection during pregnancy can lead to fetal death or congenital defects known as Congenital Rubella Syndrome. The seroprevalence of IgG to rubella virus was determined using Enzyme Linked Immunosorbent Assay among 400 pregnant women between the ages of 15-45 years attending ante-natal clinics in Kaduna metropolis. Of the 400 samples tested, consisting 20 in their first trimester, 260 in second and 120 in third trimester, 386 (96.5%) were IgG seropositive. Seroprevalence of 95.2% - 100% was obtained across the age groups. In relation to stages of pregnancy 19 (95.0%), 251 (96.5%) and 116 (96.7%) were seropositive in 1st, 2nd and 3rd trimesters respectively. The seroprevalence obtained in this study indicates that majority of the pregnant women had protective antibody due to previous exposure to the virus. However, 3.5% of the pregnant women were susceptible. Therefore, there is a need for government to incorporate rubella vaccine to be part of national immunization programme and screening of women of childbearing age so as to reduce subsequent burden of congenital rubella.

Keywords: Rubella, Seroprevalence, Pregnancy, Antibody, ELISA

INTRODUCTION

Rubella, commonly known as German measles is an infection caused by Rubella virus. Rubella virus is the only member of the genus *Rubivirus*, which belongs to the family *Togaviridae* (Brooks *et al.*, 2004). It is transmitted through respiratory droplet or transplacental infection of foetus during pregnancy (Stevens, 2010). Humans are the only known host of the virus, which occurs throughout the world (Hunt, 2008). The incubation period is 14 days with a range of 12-23 days. The symptoms (although often mild in children) include low-grade fever, malaise, lymphadenopathy, upper respiratory symptoms and maculopapular rash. Infected adult women develop arthralgia and arthritis (CDC, 2012).

Maternal rubella infection during the first trimester of pregnancy may have severe consequences, including miscarriage, stillbirth or congenital rubella syndrome (CDC, 2012). Infants born with congenital rubella syndrome (CRS) may present a number of abnormalities, including the most common, which are deafness, eye defects (cataracts and glaucoma), cardiac abnormalities, mental retardation and motor disabilities (Stevens, 2010).

Studies carried out in Nigeria, revealed seroprevalence of rubella IgG in pregnant women to be 54.1% in Maiduguri (Bukbuk *et al.*, 2002), 68.5% in Ibadan

(Bamgboye *et al.*, 2004), 97.9% in Zaria (Mohammed *et al.*, 2010) 53.0% in Benin (Onakewhoret *et al.*, 2011) and 93.1% in Zaria (Olajide *et al.*, 2012).

The World Health Organization, (2012) reported that Rubella cases have increased in Nigeria from 450 in 2010 to 3,691 in 2011. Humans are the only known reservoir of the virus (CDC, 2012) Pregnant women continue to harbor the virus and risk of CRS

The aim of this study was to determine the seroprevalence of rubella virus IgG among pregnant women attending ante-natal clinics in Kaduna metropolis, Nigeria

MATERIALS AND METHODS

Study Design

A cross-sectional study was carried out among pregnant women attending Yusuf Dantsoho, Barau Dikko and Gwamna Awan ante-natal clinics in Kaduna metropolis. Ethical approval was obtained from Kaduna State Ministry of Health. A structured questionnaire was administered to consenting pregnant women to obtain information on risk and socio-demographic factors prior to sample collection.

Blood Sample Collection and Processing

Three milliliters (3ml) of blood were collected from 400 consenting pregnant women by venopuncture between December 2011 to March 2012. The blood was allowed to clot and centrifuged at 3000 rpm for 5 minutes. The sera was carefully aspirated into plain bottles and stored at -20°C until analyzed (Bamgboye *et al.*, 2004).

Analysis of blood Samples

Laboratory analysis was carried out in the Department of Microbiology Ahmadu Bello University, Zaria. The samples were analyzed for rubella IgG antibody using a qualitative rubella IgG ELISA kits (Genesis Diagnostics Ltd, Cambridgeshire, UK). Samples with absorbance values \geq absorbance of the standard are considered positive while absorbance $<$ absorbance of the standard are considered negative. The absorbance was read at 450nm (Bamgboye *et al.*, 2004)

Data Analysis

The data obtained from questionnaires and laboratory analysis were analyzed using Statistical Package for Social Sciences version 16. Pearson Chi-square was calculated at 95% confidence interval and p-value $<$ 0.05 was considered significant to determine the association between the presence of the antibodies to the virus and other parameters (Araoye, 2004).

RESULTS

Out of the 400 sample tested, 386 (96.5 %) were seropositive while 14 (3.5 %) were seronegative for IgG to rubella virus. There was significant association between the study sites and viral seroprevalence ($\chi^2 = 7.307$, $df = 2$, $p = 0.02$) (Table 1), the highest seroprevalence of 99.3 % (133/134) was recorded among pregnant women who were attending Yusuf Dantsoho Memorial Hospital while those attending Gwamna Awan General had the lowest prevalence of 93.2 % (124/133). There were similarly higher antibody seroprevalences across all the age groups of 15-45years, which range between 95.2% to 100%. This was however, not statistically significant ($\chi^2=0.588$; $df=5$; $p=0.989$) (Table 2). The seroprevalence in relation to gestational age of pregnancy is shown in Table 3. A total of 19 (95.0%), 251 (96.5%) and 116 (96.7%) of the women were seropositive during 1st, 2nd and 3rd trimesters of pregnancy respectively.

DISCUSSION

The seriousness of Rubella is on its teratogenic effect in women particularly when infected during the first

eight weeks of pregnancy (De Santis *et al.*, 2006). The seroprevalence obtained in this study is similar to the previous reports of 97.7%, 93.1% and 89.4% by Muhammad *et al.*, (2010), Olajide *et al.* (2012), in Zaria and Adewumi *et al.* (2013) in Ibadan Nigeria while 88.6% and 92.9% were reported by Fokunang *et al.* (2010) in Younde, Cameroun and Kumbich *et al.* (2012) in Eldoret, Kenya respectively.

Table 1: Seroprevalence of Rubella IgG Antibodies among Pregnant Women Attending Ante-natal Clinics in Kaduna Metropolis, Nigeria.

Hospitals	Number Analysed	Number positive (%)	p value
Yusuf Dantsoho	134	133 (99.3)	
BarauDikko	133	129 (96.9)	
GwamnaAwan	133	124 (93.2)	0.02
Total	400	386 (96.5)	

Table 2: Age-related Seroprevalence of Rubella IgG Antibodies Among Pregnant Women Attending Ante-natal Clinics in Kaduna metropolis, Nigeria

Age Group (Yrs)	Number analyzed	Number positive (%)	p value
15-20	84	82 (97.6)	
21-25	136	131 (96.3)	
26-30	105	101 (96.2)	
31-35	51	49 (96.1)	0.989
36-40	21	20 (95.2)	
41-45	3	3 (100)	
Total	400	386 (96.5)	

Table 3: Gestational Age-related Seroprevalence of Rubella IgG Antibodies among Pregnant Women Attending Ante-natal Clinics in Kaduna Metropolis, Nigeria.

Trimester	Number Analysed	Number positive (%)	p value
First	20	19 (95.0)	
Second	260	251 (96.5)	
Third	120	116 (96.7)	0.930
Total	400	386 (96.5)	

The IgG antibody presence may possibly be due to previous exposure since none of the pregnant women was previously vaccinated against this virus (from our questionnaire survey). Overcrowding, asymptomatic nature of rubella and mode of transmission of the

infection might be the attributable factors to the seroprevalence obtained in this study. Close contact is known to enhance transmission of infection that can be acquired through air. More than 50% of rubella infection is subclinical. Asymptomatic carriers transmits the infection to susceptible individuals through nasopharyngeal secretions and infants born with CRS excretes the virus through body secretion as well (CDC, 2012). This study was carried out in the three major ante-natal clinics located in the densely populated areas of Kaduna metropolis. Similarly, previous studies by Bamgboye *et al.* (2004) and Tahita *et al.* (2013) showed higher seroprevalence of rubella antibody among pregnant women in the urban cities. Also, Fokunang *et al.* (2010) observed overcrowding and the ease with which the virus spreads among unvaccinated population attributes to high seroprevalences.

The seroprevalence was similar across the age groups. All the pregnant women were equally exposed in this study. Prior to wide-spread use of rubella vaccines, this was mainly disease of children. However, today it occurs most often in young adults (Meissner *et al.*, 2006). Previous studies in Maiduguri and Ibadan (Bukbuk *et al.*, 2002; Adewumi *et al.*, 2013) showed higher prevalence of 74.4% in 30 to 40years; 100% in 40years respectively.

In this study majority of the pregnant women started seeking for ante-natal care in Kaduna metropolis late, during their second (65.0%) and third (30%) trimesters. The maternal protective antibody (IgG) will prevent the virus from crossing the placenta thus causing minimal congenital effect to the foetus (Singh *et al.*, 2009). However, the small percentage (3.5%) of pregnant women who were found seronegative especially in their first and second trimesters have a high risk of transmitting the infection to the foetus in contact with the virus and this could lead to CRS (Kim *et al.*, 2006).

CONCLUSION AND RECOMMENDATION

In this study majority of the pregnant women were previously exposed to rubella virus hence developed protective antibody. This study has established that there are susceptible pregnant women to rubella virus infection and stand the chance of transmitting the virus to their unborn child. There is need for the government to incorporate rubella vaccines to be part of National Immunization Programme and screening of women of childbearing age so as to reduce subsequent burden of congenital rubella.

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