Seroprevalence of Rubella Virus Among Pregnant Women Attending Antenatal Clinic at Aminu Kano Teaching Hospital, Kano State, Nigeria

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Abstract: Rubella is an acute infectious disease caused by rubella virus (RUBV). Rubella virus infection remains one of the major global public health problems, especially in developing countries causing 100 000 cases of congenital rubella syndrome (CRS) every year. However, data on this subject matter is scarce in the study area. This study was aimed at determining the seroprevalence of rubella virus among pregnant women attending antenatal clinic at Aminu Kano Teaching Hospital, Kano State. It was a descriptive, cross sectional and hospital based study. A total of 276 pregnant women participated in the study. Information on bio-data, socio-demographic characteristics and medical history of the participants and risk factors were obtained via a structured questionnaire and hospital records. Blood samples were analysed for RUBV IgG and IgM antibody using ELISA method. The data generated were analysed using SPSS for window version 20.0. An overall rubella IgM prevalence of 32.25% was obtained in the study. Two (0.73%) participants were positive to only rubella IgM antibody, 58.33% to only rubella IgG antibody and 31.52% to both IgM and IgG antibodies. The result of the study showed that there was no statistical relationship between the tested socio-demographical parameters and reproductive characters. Rubella virus incidence among pregnant women in this study area was high; this indicates the need for public enlightenment campaign on possible mode of prevention and control to limit the spread of the disease and its associated morbidity and mortality.

Keywords: Congenital rubella Syndrome, German measles, Rubella Virus, Pregnant Women,

INTRODUCTION

Rubella virus infection continues being one of the global public health problems, especially in underdeveloped countries where it causes different congenital defects with significant medical consequences (Chukwuedo *et al.*, 2016). Rubella virus infection also called German measles or 3 days measles is a contagious infection caused by the rubella virus (Olajide *et al.,* 2015). Rubella virus is the only non arthropod-borne member among genus Rubivirus in the family Togaviridae (Adewumi *et al.,* 2015; Yahaya *et al.*, 2015). It is a positive-sense single-stranded RNA virus with an envelope (Chukwuedo *et al.*, 2016).

Rubella virus infection was initially thought to occur only in children, but it was later found it can affect all ages and sexes (Kolawole and Adekeye, 2017), and can affect several organs including eyes, ears, heart, brain and endocrine system (Gubio *et al.*, 2015). Rubella virus has the ability to cross the placenta of the infected pregnant mother in its first trimester and cause miscarriage, stillbirth, and congenital rubella syndrome to the baby and even mother death (Bouthry *et al.*, 2014; Priyanka *et al.,* 2017). The disease is vaccine-preventable but has no specific treatment (Olajide *et al.*, 2015). Despite the availability of a safe and effective vaccine against rubella virus infection, an estimate of over 100,000 infants globally is born with congenital rubella syndrome annually (Oyinloye *et al.,* 2014; Priyanka *et al.*, 2016).

In Nigeria, despite the availability and effectiveness of rubella virus vaccine, still, no vaccine against this virus has been introduced in the country which leads to the high health risks of contracting CRS by the fetus and hence increases morbidity and mortality as a result of this infection (Mangga *et al.*, 2017). The present study aimed to determine the seroprevalence of

rubella virus infection among pregnant women attending antenatal clinic at Aminu Kano Teaching Hospital, Kano State, Nigeria.

MATERIALS AND METHODS

Study Area

The study was carried out at Aminu Kano Teaching Hospital Kano, which is located in the ancient city of Kano along Zaria road by Gyadi-Gyadi, Tarauni Local Government, Kano State. Kano State is located in the northwest geopolitical zone of Nigeria. It comprises of 44 Local Government Areas (LGAs) with an estimated population of over 13 million and 20,760 km^2 in area and lies between latitudes 10^o 33N to 11^o 15N and longitudes 34^oCE to 8^o 20CE (NBS, 2018). The hospital serves as a referral center for the state and neighboring states such as Jigawa in the eastern border, Bauchi in the southeast, Katsina in the northwest, and Kaduna in the south. The hospital's antenatal clinic is situated at the specialty clinics arena and runs from Mondays to Thursdays with an average attendance of 200 pregnant women per day and 41600 per year (NBS, 2018).

Study Design

A descriptive cross-sectional hospital based study was conducted to determine the seroprevalence of rubella IgG and IgM antibodies among consented pregnant women attending Antenatal clinic (ANC) of Aminu Kano Teaching Hospital, Kano, Nigeria.

Ethical Clearance

Ethical clearance was obtained from Aminu Kano Teaching Hospital ethical and research committee before the commencement of the study with reference number (AKTH/MAC/SUB/12A/P- 3/VI/2444).

Informed written consent was obtained from all pregnant women that were willing to participate in the study.

Study Population

The study was carried out among 276 pregnant women attending the antenatal clinic of Aminu Kano Teaching Hospital, Kano.

Data Collection

Data of each patient was collected using a pretested, structured, and interviewer-administered questionnaire. Most of the questions were close-ended types. The questionnaire had the following components: Socio-demographic data, gestational age, history of congenital malformation in previous pregnancies, history of stillbirth, history of vaccination with rubella vaccine, history of maternal rubella in the past.

Sample Collection

Blood samples were collected by the trained personnel through vein puncture. About 5ml of the blood sample was aseptically collected from consenting pregnant women in a plain tube and allowed to clot. The blood was then centrifuged at 3000rpm for 10 minutes to obtain the serum. The serum was kept frozen at -20^oC until analysis was done.

Laboratory Analysis of Rubella Virus Antibodies

Rubella virus antibody was analyzed using Enzyme-Linked Immunosorbent Assay (ELISA) kits obtained from CALBIOTECH, following the manufacturer's instructions. The assay was carried out at Avian Influenza Laboratory (AI LAB), Aminu Kano Teaching Hospital, Kano State. The results were read in a micro-well reader and compared in a parallel manner with calibrators and controls. For rubella specific IgG and IgM antibodies the qualitative result was interpreted as, positive if the rubella IgG and or IgM index was >1.1, negative when the index was <0.9, and equivocal when the index was 0.9 – 1.1.

Statistical Analysis

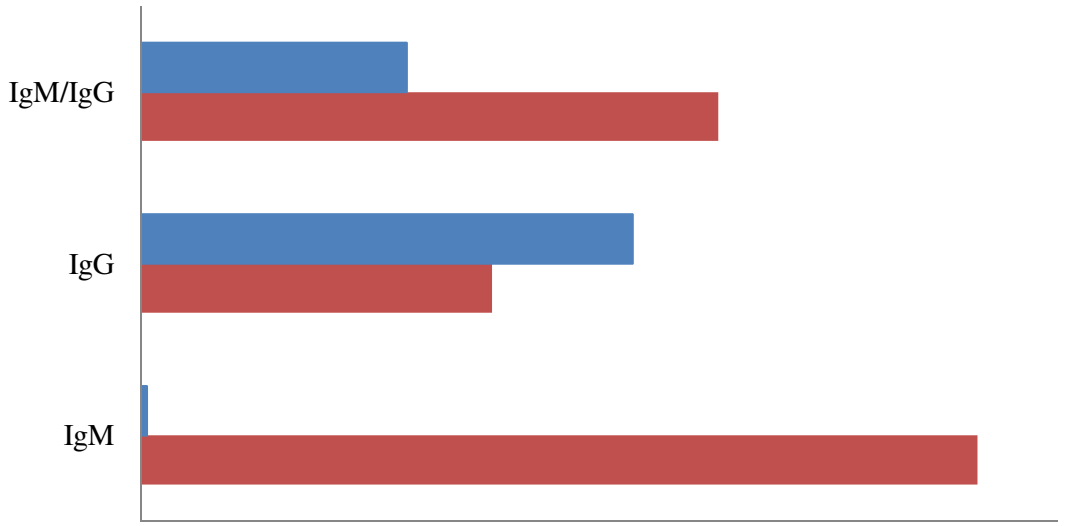
All the data generated were collated, checked, and entered into a database design using MS excel spreadsheet and was analyzed using statistical package for social science (SPSS) version 20.0. The values were expressed as means and percentages. A comparison of the variable was determined by the chi-square test. The level of significance of $P< 0.05$ was employed.

RESULTS

Out of the 276 pregnant women enrolled in this study, the highest number of the participants 161 (58.33%) were rubella IgG positive, 2 (0.73%) were rubella IgM positive while 87 (31.52%) were positive to both rubella IgG and IgM (Figure 1). The overall rubella seroprevalence among pregnant women in this study was 89 (32.25%).

The highest seropositive for the rubella virus was among participants from urban area 132 (56.90%) IgG positive, 75 (32.33%) IgM/IgG positive, and 1 (0.43%) IgM positive. Participant age group 40 – 44 years had the highest incidence of 3 (50.00%) IgM/IgG positive, 2 (33.33%) IgG positive and 0 (0.00%) IgM positive and least was observed among age groups 15 – 19 years with 2 (18.18%) IgM/IgG, 0 (0.00%) and 9 (81.82%). Thirty (32.26%) IgM/IgG positive, 0 (0.00%) IgM, and 55 (59.14%) positive to only IgG participants have secondary level of education. All the observed socio demographical parameters showed no statistically significant relationship with the presence of the infection as p-value >0.05 (Table 1).

The distribution of rubella virus antibodies positive with reproductive characters shows the highest incidence was among participants with null parity 34 (34.00%) to IgM/IgG, 1 (1.00%) IgM, and 55 (55.00%) IgG positive. Based on the trimester highest incidence was found among participants in first trimester 11 (57.90%) IgM/IgG positive, 0 (0.00%) IgM, and 7 (36.84%) IgG only. Most of the subjects with positive had a record of stillbirth and the entire subjects that reported to have babies with congenital malfunction were positive to both IgM/IgG rubella antibodies (Table 2)



	IgM		IgG		IgM/IgG	
Positive	2	0.73	161	58.33	87	31.52
Negative	274		115		189	

Table 1: Comparison between Seroprevalence and Socio-demographic Profiles

Socio-Demographic Factors	No. Examined	ELISA Result			*P – value*
		IgG	IgM	IgM/IgG	
Address					
Rural	44	29 (65.91)	1 (2.27)	12 (27.27)	0.232
Urban	232	132 (56.90)	1 (0.43)	75 (32.33)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
Age (Years)					
15 – 19	11	9 (81.82)	0 (0.00)	2 (18.18)	0.574
20 – 24	67	36 (53.73)	0 (0.00)	23 (34.33)	
25 – 29	85	49 (57.65)	1 (1.18)	29 (34.12)	
30 – 34	70	39 (55.71)	0 (0.00)	23 (32.86)	
35 – 39	37	26 (70.27)	1 (2.70)	7 (18.92)	
40 – 44	6	2 (33.33)	0 (0.00)	3 (50.00)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
Education Level					
Primary	7	3 (42.86)	0 (0.00)	2 (28.57)	0.558
Secondary	93	55 (59.14)	0 (0.00)	30 (32.26)	
Tertiary	176	103 (58.52)	2 (1.14)	55 (31.25)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
Occupation					
Civil Servant	57	28 (49.12)	1 (1.75)	23 (40.35)	0.398
Entrepreneur	26	13 (50.00)	0 (0.00)	12 (46.15)	
House Wife	154	98 (63.64)	1 (0.65)	40 (25.97)	
Student	39	22 (56.41)	0 (0.00)	12 (30.77)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	

Table 2: Comparison between Seroprevalence and Reproductive Characters

Reproductive Characters	No. Examined	ELISA Result			*P – value*
		IgG	IgM	IgM/IgG	
Parity					
Null para	100	55 (55.00)	1 (1.00)	34 (34.00)	0.520
Primi para	60	41 (68.33)	1 (1.67)	14 (23.33)	
Multi para	116	65 (56.04)	0 (0.00)	39 (33.62)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
Trimester					
First	19	7 (36.84)	0 (0.00)	11 (57.90)	0.231
Second	101	62 (61.39)	0 (0.00)	30 (29.70)	
Third	156	92 (58.97)	2 (1.28)	46 (29.49)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
Still Birth					
Yes	26	12 (46.15)	0 (0.00)	10 (38.46)	0.439
No	250	149 (59.60)	2 (0.80)	77 (30.80)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
History of Abortion					
Yes	95	57 (60.00)	1 (1.05)	29 (30.53)	0.936
No	181	104 (57.46)	1 (0.55)	58 (32.04)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
Number of Abortion					
None	182	104 (57.14)	1 (0.55)	59 (32.42)	0.991
1 – 3	84	51 (60.71)	1 (1.19)	25 (29.76)	
>3	10	6 (60.00)	0 (0.00)	3 (30.00)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	
Congenital Malfunction					
Yes	2	0 (0.00)	0 (0.00)	2 (100.00)	0.179
No	274	161 (58.76)	2 (0.73)	85 (31.02)	
Total	**276**	**161 (58.33)**	**2 (0.73)**	**87 (31.52)**	

DISCUSSION

Out of the 276 pregnant women enrolled in this study, the overall rubella seroprevalence among pregnant women in this study was 89 (32.25%). The highest number of the participants 161 (58.33%) were rubella IgG positive, 2 (0.73%) were rubella IgM positive while 87 (31.52%) were positive to both rubella IgG and IgM. The presence of the rubella virus antibody IgM indicated the active infection. The result obtained in this study is higher than what was reported by previous studies done by Koki *et al.* (2014), Olajide *et al.* (2015), and Okonko *et al.* (2019) that recorded the IgM prevalence of 17.4% in Muhammad Abdullahi Wase Specialist Hospital Kano state, 7.9% in Bamalli Nuhu Maternity Hospital, Kano, Kano State, and 7.8% at Braithwaite memorial specialist hospital (BMSH), Port Harcourt and University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers state. The rubella virus IgG antibody obtained in this study conforms to what was obtained by Adewumi *et al.* (2013) who recorded for IgG, the prevalence of 89.4% in Ade-Oye Maternity Hospital in Ibadan, southwestern, Nigeria, that of Bigwan *et al.* (2013) that was carried out in Plateau state, Nigeria and recorded a prevalence of 92.51%. The presence of IgG indicated previous exposure to the virus since most participants have not vaccinated against this virus since the rubella vaccine is not part of the routine vaccine adopted in Nigeria.

Our study recorded the highest prevalence among the pregnant women aged group 41 – 44 years and least among those aged group 15 – 19 years. This agreed with the finding of Olajide *et al.* (2015), Onyeukwu *et al.* (2018) and Okonko *et al.*, 2019. But disagree with the report of Koki *et al.* (2014), Yahaya *et al.* (2015) and Mangga *et al.* (2017). The report of this study shows no statistical relationship between rubella viral infections with participants' educational level, occupations, and their reproductive conditions. This agrees with the finding of other studies done by Tahita *et al.* (2013), Olajide *et al.* (2015), Zanga *et al.* (2017), Wondimeneh *et al.* (2018) and Taku *et al.* (2019).

CONCLUSION

This study confirms the presence of rubella virus infection among pregnant women attending the antenatal clinic of Aminu Kano Teaching Hospital, Kano. Out of 276 pregnant women screened 0.72% was IgM positive, 58.33% IgG positive and 31.52% were IgM/IgG rubella virus infection positive. The study showed no statistical relationship with tested socio-demographical and reproductive characters. Therefore, the study shows the need for implementation of the rubella virus infection vaccine among pregnant women in the study area.

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