

Seroepidemiology of rubella IgG among unvaccinated pregnant women attending antenatal clinics from two rural communities in Plateau State, Nigeria

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Abstract: Background: Rubella is a mild illness with most cases goes undiagnosed because of its sub clinical nature. However, the disease poses serious threat such as congenital rubella defects, abortions, and still birth if a pregnant woman contracted the infection during her first trimester. Unfortunately lack of sufficient data on its prevalence and incidence with unavailability of rubella vaccines in our antenatal clinics is of great dangers to our sero-negative women with their unborn babies. Objective: To determine the sero-prevalence of rubella IgG within the two Nigerian communities. Methods: Two hundred and sixty seven (267) pregnant women attending antenatal clinics in Mangu and Pankshin General Hospital and Primary Health Care (PHC) Clinics were screened for Rubella IgG using ELISA Test kit (Globalemed, Alexandria VA USA) based on the manufacturer's instructions. Questionnaires were also used to obtain other vital bio-data of patients and results analyzed using SPSS version, 13.0 statistical software package. Results: Out of all the samples screened, 247(92.51%) were seropositive for rubella IgG. Rubella IgG was detected in all age groups and occupational status considered and the results indicated a significant relation with the presence of the antibody ($P<0.05$). So also, Rubella IgG was also detected from all the different parity groups, some socio-cultural variables, probable clinical manifestations and location. However, the results indicated that there were no significant relationships between the presence of the antibody with these variables ($P>0.05$). Conclusion: This work indicates that most of the women screened (92.51%) were already immune due to natural exposure to the virus. The remaining 7.49% needs to be protected from being infected with the virus especially during the first trimester of pregnancy which can result to congenital defects with fatal consequences. As such, there is need for more sero-surveys on rubella in the country to support the advocacy for the inclusion of rubella vaccination in the National Programme on Immunization (NPI).

Keywords: Rubella, Pregnant Women, Two Nigerian Communities

1. Introduction

Rubella is a mild illness caused by a non-arthropod-borne member of the family togaviridae and is the only member of the genus *Rubivirus* [1]. At least half of all primary rubella infections goes undiagnosed because of the sub clinical nature of the infection [2].

The most serious consequence of rubella infection is the birth defects called congenital rubella syndrome which commonly occur if a woman is infected in the first trimester of her pregnancy. Maternal infection with rubella

virus plays a critical role in pregnancy wastage and its occurrence in patients with bad obstetric history (BOH) has significant consequences. Since the licensure of the rubella vaccine, rubella and congenital rubella syndrome have declined dramatically. However, recently, there has been a moderate increase in rubella syndrome. The increase in rubella has occurred in unvaccinated adolescents and adults as well as in children and adults in religious communities with low levels of vaccination [3, 4].

The infection caused by rubella virus is usually mild, and patients with this infection present with fever and skin rash. Many cases are asymptomatic. Accurate laboratory diagnosis of past or recent rubella is essential for both clinical and epidemiological studies and for the design and monitoring of vaccination programs [1].

Rubella is an acute febrile illness characterized by a rash and lymphadenopathy that affects children and young adults. It is the mildest of common viral exanthems. The disease is characterized by appearance of rash, fever, sore throat, rhinitis, lymphadenopathy and exanthema which begins as discrete macules on the face that spread to the neck, trunk and limbs [5- 7].

Rubella occurs worldwide. The number of reported cases is high in countries where routine rubella immunization is either not available or was recently introduced [8]. Seroprevalence of rubella antibodies has been recorded in developed countries such as Europe and the United States and also in many developing countries including Africa, India, Middle and Far East, Jamaica, Malaysia, Panama, Sri Lanka etc [9- 11]. Before the introduction of a vaccine in countries such as Australia, the United States of America, the United Kingdom and European countries, rubella epidemics occurred in cycles of 6–9-year intervals [11].

The risk factors for rubella includes: contact with a probable confirmed patient or a person with a rash illness suspected of being rubella; transmission setting (e.g. day care center, school, work place, place of worship, athletic event or other congregate or social gathering [12]. This study has been undertaken to document the seroprevalence of this infection in the setting of Nigeria so as to add to the existing data on this infection for possible public health usage.

2. Materials and Methods

2.1. Study Area

Plateau State of Nigeria covers an area of 26,890 sq kms is located in the Middle Belt Zone. Plateau gets its name from Jos Plateau. The state is also known as the home of peace and tourism. It enjoys a relatively temperate climate with average temperatures between 18°C and 22°C. Mangu and Pankshin Local Government Areas are situated in the Central Senatorial District of the State. According to the 2006 Population Census, Pankshin had a population of 190,114 people while Mangu had 300,520 [13, 14].

Most of the people in the area are farmers. The socio-cultural behaviors of the people in the area such as communal farming, cultural festivals like “Puus Dung” and “Puus Kaat”, drinking local gin in congested congregates and the practice of two people pairing and drinking in the same cup or calabash at the same time, social gatherings such as weddings and religious meetings, the tourist attraction sites such as Panyam Fish Farm, Ampidong (Crater Lake), Kerang volcanic cones and springs, Pankshin Hills, Markets and other institutions situated in

the area, together with the serene weather attracts people from diverse works of life all over the country and other nationality to the area. All these factors and activities can predispose the people in the area to the virus.

2.2. Study Population

Two hundred and sixty seven (267) pregnant women attending antenatal clinics were enrolled for the study from the four major health facilities in the study area which were selected based on their high number of patronage and accessibility when compared with the other facilities which are situated in remote areas. Structured questionnaires with data such as age, occupation, name of clinic, number of pregnancy, history of pregnancy complication, presence of certain clinical manifestations before or during pregnancy, presence of any noticeable congenital defects, attendance in certain socio-cultural activities and any history of rubella immunization. The questionnaires were administered to all the women who gave their consent with the assistance of the health personnel from the clinics, the questionnaires were filled appropriately. Ethical Clearance was obtained from the Plateau State Ministry of Health before the commencement of the work.

2.3. Sample Collection and Processing

Five milliliters (5mls) of venous blood was collected from each of the women, the serum then separated and stored in a freezer at -20°C until ready for use. Enzyme – Linked Immunosorbent Assay (ELISA, Globalemed, LLC. Alexandria VA USA) was used to screen for rubella IgG. The samples were analyzed according to the manufacturer’s instructions. Data obtained were captured on Microsoft Excel and were subjected to statistical analysis using statistical software SPSS version 13.00. Pearson chi-squares were calculated at a 95% confidence interval. A value of $P < 0.05$ was considered significant.

3. Results

Out of the 267 samples screened, 247 (92.5%) were rubella IgG Seropositive while 20 (7.49%) were Sero-negative. The rubella IgG was detected in all the different age groups. A statistical analysis revealed a significant association between the prevalence of the antibodies in relation to the age groups ($X^2 = 12.27$; $P = 0.03$) as shown in Table 1.

The seroprevalence of Rubella IgG among samples screened from the various antenatal clinics as shown in table 2 revealed a highest prevalence of 97.65% from Primary Health Care (PHC) Clinic Pankshin followed by General Hospital Pankshin with 96.00%, while 95.00% and 93.98% from General Hospital Mangu and PHC Mangu respectively. There was however, no significant differences observed in the antibody prevalence from these health facilities ($X^2 = 6.126$; $P = 0.106$).

Of the 267 sera screened in relation to different

occupational groups of the women. The highest prevalence of 100.00% was observed among Civil Servants, 96.55% among full House wives, 93.10% was among Business women, 85.71% among Farmers and 79.16% among Students/Applicants as shown in Table 3. There was no comparable antibody prevalence in almost all the occupational groups ($X^2 = 14.347$; $P = 0.0006$).

The seroprevalence of Rubella IgG in relation to different Parity groups is shown in Table 4. Of the 83 sera screened from Primigravidae women, 80 (96.38%) were seropositive, while out of 132 Multi-parous women, 122 (92.42%) were seropositive, so also, out of 52 Grand multiparous women, 45 (86.54%) were seropositive for Rubella IgG. The result showed a no significant association in the antibody prevalence in relation the parity groups ($X^2 = 4.476$; $P = 0.107$).

Of all the women screened, some of them admitted having experienced at one time or the other some of the probable clinical presentations associated with Rubella. The patients' responses to history of some of the clinical manifestations similar to rubella were considered as shown in Table 5. The results showed a comparable antibody prevalence in almost all the probable clinical presentations considered ($P > 0.05$).

The seroprevalence of Rubella IgG in relation to some socio-cultural variables considered in this study as shown in Table 6. The study revealed that there were no significant association between the different socio-cultural variables with antibody prevalence ($P > 0.05$). The Seroprevalence of Rubella IgG in relation to Local Government Area (Location) as shown in Table 7 indicated that there was no significant relationship between the Local Government Areas (Location) and the antibody seroprevalence ($X^2 = 2.146$; $P = 0.143$).

Table 1. Seroprevalence of Rubella IgG in relation to age.

Age groups (Years)	No. Screened	No. positive (%)
15 - 20	41	38(92.68)
21 - 25	85	77(90.60)
26 - 30	90	85(94.44)
31 - 35	32	31(96.88)
36 - 40	15	14(93.33)
≥ 41	4	2(50.00)
Total	267	247(92.51)

$X^2 = 12.267$ DF = 5 $P = 0.031$

Table 2. Seroprevalence of Rubella IgG in the various clinics

Location (States)	No. Screened	No. positive (%)
PHC Pankshin	85	83(97.65)
Gen. Hospital Pankshin	50	48(96.00)
PHC Mangu	83	78(93.98)
Gen. Hospital Mangu	40	38(95.00)
Total	267	247(92.51)

$X^2 = 6.126$ DF = 3 $P = 0.10$

Table 3. Seroprevalence of Rubella IgG in relation to Occupational groups.

Occupational status	No. Screened	No. positive (%)
Farmer	49	42(85.71)
Business	72	67(93.10)
Full house wife	87	84(96.55)
Civil servant	35	35(100.00)
Student/Applicant	24	19(79.16)
Total	267	247(92.51)

$X^2 = 14.347$ DF = 4 $P = 0.0006$

Table 4. Seroprevalence of Rubella IgG in relation to parity.

Parity	No. Screened	No. positive (%)
Primigravida	83	80(96.38)
Multigravida	132	122(92.42)
Grand Multigravida	52	45(86.54)
Total	267	247(92.51)

$X^2 = 4.476$ DF = 2 $P = 0.107$.

Table 5. Seroprevalence of Rubella IgG in relation to some probable clinical presentations (N = 267).

Clinical features	No. with clinical feature	No. /% Positive	X^2 / P Value
Still birth	19	19(7.12)	$X^2 = 1.656$ $P = 0.198$
Miscarriages	40	5(13.11)	$X^2 = 1.704$ $P = 0.192$
Threatening abortion	9	9(3.37)	$X^2 = 0.754$ $P = 0.385$
Swollen joints	18	17(6.37)	$X^2 = 0.104$ $P = 0.747$
Fever	71	65(24.34)	$X^2 = 0.129$ $P = 0.720$
Sore throat	4	4(1.45)	$X^2 = 0.329$ $P = 0.566$
Itching	24	24(8.99)	$X^2 = 2.135$ $P = 0.144$
Rashes	17	17(6.37)	$X^2 = 1.470$ $P = 0.225$

Table 6. Seroprevalence of Rubella IgG in relation to some socio-cultural variables.

Function attended	Positive valid		Negative valid		X^2 / P value
	Yes	No	Yes	No	
Wedding	232	15	20	0	$X^2 = 1.287$ $P = 0.257$
Cultural festival	120	127	12	8	$X^2 = 0.965$ $P = 0.326$
Religious gatherings	229	18	20	0	$X^2 = 1.563$ $P = 0.211$
Communal farming	91	156	8	12	$X^2 = 0.079$ $P = 0.779$
Market	214	33	19	1	$X^2 = 1.164$ $P = 0.281$
Drinking local gin in local bars	22	225	2	18	$X^2 = 0.027$ $P = 0.869$

Table 7. Seroprevalence of Rubella IgG in relation to Local Government Area (Location).

Local Govt. Area	No. Screened	No. positive (%)
Mangu	122	116(95.10)
Pankshin	145	131(90.34)
Total	267	247(92.51)

$$X^2 = 2.146 \quad DF = 1 \quad P = 0.143.$$

4. Discussion

Although Rubella vaccination is not part of the National Immunization Programme in Nigeria, the results obtained showed that 247 (92.51%) of the subjects had antibodies to rubella virus, this suggest previous natural exposure to the virus. The result obtained agreed with an earlier work carried out in Jos, North Central Nigeria in 2005 and a recent work in Ade-Oyo Maternity Hospital in Ibadan, Southwestern, Nigeria which showed a prevalence of 90.80% and 89.4% respectively among pregnant women [15, 16]. Most studies in Africa showed that more than 80% of pregnant women were immune to Rubella [17].

It has been noted that there is a significant association between the prevalence of rubella IgG antibody with age [18]. The results obtained revealed that all the age groups considered had antibodies to rubella virus. The antibody prevalence increased and then decreased between different age groups not following a single directional trend, this showed that individuals exposed to rubella have the tendency to develop immunity irrespective of their age groups. This finding disagreed with a work carried out among non-immunized pregnant women in Maiduguri which reported that with increased maternal age the percentage of immune women increased significantly [18].

The result obtained in the study showed that primary Health Care Clinics Pankshin and General Hospital Pankshin recorded a higher prevalence rate of 97.65% and 96.00% respectively, while General Hospital Mangu and PHC Mangu had 95.00% and 93.98% respectively. These differences may be due to some slight differences in the socio-economic status of the women. Since most of the women were of the low socio economic status, they prefer to attend the Primary Health Care clinics and General Hospitals which were by far cheaper than that of the private and teaching hospitals.

The data obtained revealed that there is a significance association between the antibody prevalence and the occupational groups considered. The highest prevalence rates were recorded among civil servants (100.00%), full time house wives (96.55%), and business women (93.10%), while the lowest were among farmers (85.71%) and students/applicants (79.16%). These may be attributed to the mode of transmission of the infection as well as the possibility of some of the occupational groups predisposing members to the infection more than others.

The seroprevalence of rubella in relation to parity in this study showed that there is no significant association

between the antibody prevalence and parity. The result revealed a gradual decrease in the antibody seroprevalence from 96.38% among primigravidae to 92.42% and 86.54 in multiparous and grandmultiparous women respectively. This work disagreed with a similar work conducted in University Teaching Hospital Maiduguri, Northern Nigeria in which it was reported that there was a gradual increase in antibody prevalence from the primigravidae to the grand multiparous women [18]. The discrepancies in the two studies may be due to the fact that any individuals exposed to the virus irrespective of parity groups can develop immunity against the infection.

The seroprevalence of Rubella antibody in relation to some probable clinical presentations as seen in this work indicated that there was no relationship in the spread of the infection with those clinical manifestations considered. It has been reported that several infections such as human parvovirus, certain arboviruses, many of the enterovirus groups of Picornaviruses, some adenoviruses, Epstein Bar virus, Scarlet fever, and toxic drug reactions, present clinical symptoms similar to rubella [19]. This suggests that clinical manifestation can not be used for a definite diagnosis for the evidence of the infection. Bio-data from the questionnaires revealed that only few of the women noticed some of the clinical features. This should not be a surprise because most of the clinical presentations are transients and they usually go unnoticed. This study disagreed with a similar finding in University Teaching Hospital, Ilorin, North central Nigeria which reported a significant association among the pregnant women with history of fever, rashes and joint pains [20].

The seroprevalence of Rubella IgG in relation to the socio-cultural variables considered which include their socio-economic as well cultural activities as seen in this study revealed that there was no significant association between these variables and antibody prevalence of Rubella.

5. Conclusion

This study revealed that most of the pregnant women screened (92.51%) had evidence of Rubella immunity, although none of them had history of Rubella vaccination, this showed that they were already immune to the infection through natural exposure to the virus. The remaining 7.49% needs to be protected from being infected with the virus especially during the first trimester of pregnancy which can result to congenital defects with fatal consequences. As such, there is need for more sero-surveys on rubella in the country to support the advocacy for the inclusion of rubella vaccination in the National Programme on Immunization (NPI).

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