ORIGINAL RESEARCH ARTICLE

Serologic Survey of Specific Rubella Virus IgM in the Sera of Pregnant Women in Makurdi, Benue State, Nigeria

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ABSTRACT

Although a major section of pregnant women in Nigeria are immune to rubella infection, cases of congenital rubella syndrome are still been seen in hospitals. Rubella is not a reportable disease in Nigeria and data of its epidemiology are extremely rare. In this study, we estimate the burden of acute rubella virus infection among pregnant women during their first trimester in Makurdi-Benue State-Nigeria. Anti-rubella IgM were detected using a commercially available quantitative enzyme immunoassay. Of the 534 (mean age=28.1±1.7years) sera sample tested, 21 (3.9%;95%CI=±1.64%) were positive for Rubella IgM antibodies. We also extrapolated by mathematical modeling that 4.2% represents the actual/real susceptible population in Nigeria. There was no significant correlations between rubella infection and age (p>0.05). Although the incidence of rubella is low we suggest the antenatal screening and vaccination of all females of child bearing age to eliminate this potentially devastating virus in the county *(Afr J Reprod Health 2009; 13[2]:69-73).*

RÉSUMÉ

Enquête sérologique du virus Rubella 1gm spécifique dans les sérums des femmes enceintes à Makurdi, Etat de Benue, Nigeria. Bien que la majorité des femmes enceintes au Nigéria soient immunisées contre l'infection rubella, on voit beaucoup de cas du syndrome de rubella dans les hôpitaux. Rubella n'est pas une maladie à déclaration obligatoire au Nigéria et les données sur son épidémiologie sont extrêmement rares. Dans cette étude, nous estimons le fardeau de l'infection du virus rubella aiguë chez les femmes enceintes au cours de leur premier semestre à Makurdi, Etat de Benue, Nigéria. On a détecté l'antirubella 1gm à l'aide d'un immunodosage de l'enzyme quantitative qui est disponible de manière commerciale. Sur les 534 (age moyen = 28, 1±1,7ans) dont les échantillons des sérums ont été testés, 21(3,9% ; 95% CI = ±1,64%) ont été positifs pour les anticorps de rubella 1gm. Nous avons également extrapolé, à travers des modèles mathématiques, que 4,2% représente la vraie population susceptible au Nigéria. Il n'y avait pas de corrélation importante entre l'infection de rubella et l'âge (p>0,05). Bien que l'incidence de rubella soit basse, nous préconisons le dépistage prénatal et la vaccination de toutes les femmes en âge d'avoir des enfants afin d'éliminer ce virus qui peut avoir des conséquences devastateuses dans le pays *(Afr J Reprod Health 2009; 13[2]:69-73).*

KEYWORDS: Rubella; Anti-IgM, Pregnant women; Nigeria

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Introduction

Rubella is generally a mild illness and serious complications are rare. However, primary maternal rubella virus infection during the first trimester of pregnancy carries a high risk for the development of the congenital rubella syndrome (CRS) with characteristic malformations of the heart, eye and ear or even dead of the fetus[1,2,3]. Although rubella vaccination has reduced the incidence of rubella virus substantially; the world health organization (WHO) estimates that worldwide more than 110 000 cases of CRS each year most of them in developing countries[4].

In Nigeria, previous studies among pregnant women have detected rubella IgG antibodies to 68.5% in Ibadan, 54.1% in Maiduguri and 76% in Lagos[5,6,7]. Also in the seventies in a multicenter study (North, East and West Nigeria), Odelola et al[8] showed that an average of 68% of the Nigerian population possessed rubella antibody. Therefore, on the average, approximately 66.2% of pregnant women in Nigeria are already immune to rubella infection probably due to subclinical or clinical exposure to rubella virus as there is no policy for immunization against rubella infection and there is a 33.8% susceptible population. Although a major section of pregnant women in Nigeria are immune, cases of CRS are still been seen in hospitals. For example, in 2006, a case of confirmed CRS was reported in Port Harcourt in a three month old male with heart failure[9]. This means that pregnant women continue to harbor the virus despite the availability of an effective vaccine. Rubella is not a reportable disease in Nigeria and data of its burden are extremely rare. We therefore designed this study to estimate the incidence of acute rubella virus infection (rubella anti-IgM) among pregnant women during their first trimester in Makurdi-Benue state of North-central Nigeria.

Methods

After explaining the importance of the study to the clients and informed concern obtained, five hundred and thirty four blood samples were randomly collected (by standard venepucture into sterile plain bottles without anticoagulant) from pregnant woman during their first trimester from maternity centers and hospitals within Makurdi and its surroundings. Makurdi is located in Benue State of north-central Nigeria. The samples were collected between February and July 2007 and transported on ice in cold boxes to the Virology laboratory at IBL for the serodiagnosis of rubella virus infection. Blood samples were clotted and centrifuged for serum separation prior to testing. All sera were stored at -24^{0}C until used. Evidence of recent rubella infection was tested using the quantitative rubella IgM specific enzyme immunoassay (EIA) test kit (catalog #: BC-1083- purified rubella antigen; sensitivity=97.8%, specificity=99.3%, accuracy=98.7%, Biocheck Inc; Foster City, CA). The plates were read at a wavelength of 450nm using the EIA reader (BIO-RAD 2100, version 6.1,

US). Positive and negative results were then determined according to the instructions of the manufacturers of the kit. Data analysis was performed using the SPSS version 15.0 statistical package for windows (Inc. Chicago, IL). The association between recent rubella virus infection and age were measured by the Pearson's chi-square test ($\chi 2$), Fisher's exact test (2-sided) and P values <0.05 were considered to be statistically significant. A simple linear mathematical modeling was used to extrapolate the true/real susceptible population to rubella infection using available dataset.

Results

Of the 534 sera sample tested, 21 (3.9%; 95%CI=±1.64%) were positive for Rubella IgM antibodies. 3.9% of 33.8% susceptible pregnant women have a real or actual susceptibility of rubella infection. Therefore, by mathematical modeling, the actual corrected susceptible population for rubella in pregnancy in Nigeria was estimated to be 4.2%. All the women who participated in this study were between the ages of 18 - 36 years (mean= 28.1±1.7years; 95%CI= ±0.14%) and we did not see any age preponderance. Also, the difference between the seroprevalence of rubella IgM (3.9%) and the true susceptible population (4.2%) was not statistically significant ($p>0.05$).

Discussion

When a woman is infected with the rubella virus early in pregnancy, she has a 90% chance of passing the virus on to her fetus and this can cause the death of the fetus or it may cause CRS. In this present study, we have evaluated the incidence of acute rubella infection among pregnant women during their first trimester. We report that 3.9% of the women studied had a detectable IgM level which is a marker of recent rubella infection. Detection of IgM antibody is well established as a means of diagnosing recent rubella/CRS and is recommended by the WHO as the primary test for the laboratory confirmation of rubella. Although a major section of pregnant women in Nigeria are immune our result shows that cases of rubella infection still occur in Nigeria among pregnant women[10]. This dispels the notion among many hospital workers who think that rubella is no longer an issue. In 2006, a case of confirmed CRS was reported in Port Harcourt in a three month old male with heart failure[9]. The defects caused by rubella infection on children are severe and irreversible; hence the medical community in Nigeria must rise up to this challenge.

From previous studies, about a quarter of pregnant women are susceptible to rubella infection[5]. Based on this and results obtained from this study, a total of 4.2% of pregnant women were found to be the population susceptible to rubella infection. This means that 4.2% of women do reach child bearing age without developing immunity against rubella and are therefore at risk of delivering a malformed baby. This corroborates with multi-center studies carried out by

Gomwalk et al in many African countries[10]. A recent study in Australia and sixteen European countries showed the effectiveness of rubella immunization programs in the reduction of rubella infection over time[11]. Nigeria has in its hands an opportunity to eliminate this virus since the burden is low and the actual susceptible population is small. Nigeria could borrow from the example of Cuba that has successfully eliminated rubella/CRS after national vaccine coverage of over 95%[12]. Unfortunately, Nigeria has not introduced rubella vaccine into its routine national immunization program (NID). Introduction of rubella vaccination into the NID program would favor the interruption of endemic rubella since cases still do occur and a portion of women of childbearing age remain virgin to rubella infection and are predisposed during early pregnancy. This comes with the responsibility of establishing surveillance for CRS and rubella. Nigeria also has no organized program for monitoring the epidemiology of rubella or CRS and as such does not report cases to the WHO. Up to 90% of infants born to women who acquire rubella during the first trimester of gestation become affected[13]. So every effort should be put to prevent infection in pregnant woman and women of child bearing age since cases of rubella still do occur and since there is a rubella susceptible population in Nigeria. We think that this is a matter of high priority and we suggest antenatal screening and the introduction of rubella vaccine as part of the national programme on immunization for all infants and females of child bearing age. We believe that this effort will eliminate the virus in this country.

References

1. Cradock-Watson JE, Ridehalg MKS, Anderson MJ, Pattison JR. Outcome of asymptomatic infection with Rubella virus during pregnancy. *J Hyg 1981; 87:147-54.*
2. Miller E, Cradock-Watson JE, Pollock TM. Consequences of confirmed maternal rubella at successive stages of pregnancy. *Lancet 1982; 2:781-4.*
3. Robertson SE, Cutts FT, Samuel R, Diaz-Ortega JL. Control of rubella and congenital rubella syndrome (CRS) in developing countries, part 2: vaccination against rubella. *Bull World Health Organ 1997; 75 :69-80*
4. WHO. Geneva: World Health Organization; 2000. Report of a meeting on preventing congenital rubella syndrome: immunization strategies, surveillance needs. www.who.int/vaccinesdocuments/DocsPDF 00/www508.pdf (accessed 11th, June 2008).
5. Bamgboye AE, Afolabi KA, Esumeh FI, Enweani IB.Prevalence of rubella antibody in pregnant women in Ibadan, Nigeria. *West Afr J Med. 2004; 23(3):245-8.*
6. Bukbuk DN, el Nafaty AU, Obed JY.Prevalence of rubella-specific IgG antibody in non-immunized pregnant women in Maiduguri, north eastern Nigeria. *Cent Eur J Public Health. 2002;10(1-2):21-3.*
7. Onyenekwe CC, Kehinde-Agbeyangi TA, Ofor US, Arinola OG. Prevalence of rubella-IgG antibody in women of childbearing age in Lagos, Nigeria.*West Afr J Med. 2000;19(1):23-6.*
8. Odelola HA, Fabiyi A, Familusi JB. Distribution of rubella antibodies in Nigeria. *Trans R Soc Trop Med Hyg. 1977;71(5):425-6.*
9. Otaigbe BE, Brown T, Esu R. Confirmed congenital rubella syndrome--A case report. *Niger J Med. 2006;15(4):448-50.*

10. Gomwalk NE, Ahmad AA.Prevalence of rubella antibodies on the African continent. *Rev Infect Dis. 1989;11(1):116-21.*

11. Nardone A, Tischer A, Andrews N, Backhouse J, Theeten H, Gatcheva N, Zarvou M, Kriz B, Pebody RG, Bartha K, O'Flanagan D, Cohen D, Duks A, Griskevicius A, Mossong J, Barbara C, Pistol A, Slaciková M, Prosenc K, Johansen K, Miller E. Comparison of rubella seroepidemiology in 17 countries: progress towards international disease control targets. *Bull World Health Organ. 2008;86(2):118-25.*

12. (de Los Angeles Ribas M, Galindo M, Torres G, Valcarsel M, Cancio R, Guzmán MG, Rosario D, Resik S, Rodriguez C, Garcia D, Tejero Y.Role of the virology diagnosis laboratory in the surveillance of rubella virus Cuba 1988/2000. *Vaccine. 2004; 22(31-32):4287-90.*

13. Centers for Disease Control and Prevention (CDC). Rubella prevention. *MMWR Morb Mortal Wkly Rep. 1984;33:301-10; 315-8.*