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Seroprevalence of *Varicella-Zoster Virus* Immunoglobulin Mu (IgM) Antibodies among Women in Part of North-Central Nigeria

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ABSTRACT

Chicken pox is a unexpected onset, very contagious disease that is categorized by a widespread, blister-like rash. It naturally infects children in moderate regions; grown-ups are more often sick in humid areas. Chicken pox is caused by the varicella-zoster virus, a type of herpesvirus. This survey was carried out to determine the seroprevalence of varicella IgM antibody among women in part of North Central Nigeria, and to estimate the risk of varicella- zoster virus (VZV) infection in this group. We obtained blood samples from the study subjects along with demographic information, immunization records, and vaccine-preventable disease history. Serum samples were tested using a whole-virus IgM VZV-specific commercial enzyme- linked immunosorbent assay (ELISA) kit. Overall, 180 women, were interviewed, with 179 providing adequate blood samples. The overall seroprevalence of varicella IgM antibodies was 50.3%, ranging from 42.2% in Abuja to 53.6% in Niger and 66.7% in Benue. These results demonstrate a high prevalence of varicella seronegativity among women population studied. We recommend introducing improved education about varicella among groups and growing vaccination program or repetitive testing for serum varicella antibody to avoid VZV- related injury and mortality, mainly in adolescents, adult, and women of childbearing age.

INTRODUCTION

Varicella is a highly contagious, exanthematous disease caused by the alphaherpesvirus varicella- zoster virus (VZV), which is typically associated with epidemics among children [1]. Although varicella is self-limiting, it may result in complications and death in healthy children. Higher morbidity and mortality occurs among adults [2-3]. The risk of complications may be increased in pregnant women [4] and neonates [5].

The epidemiology of varicella varies in tropical and temperate climates. In temperate climates, varicella occurrence is largely limited to childhood. For example, in the United States, more than 90% of varicella cases occur in persons less than 15 years old [6]. However, in tropical and subtropical climates, a higher proportion of primary cases are seen in adolescents and young adults [7-8]. In Nigeria, a country with a variety of climates, including a tropical climate in the northern region, there is limited data on immunity against VZV in adults in different parts of the country [9].

The tropism of VZV for skin is the most obvious clinical manifestation of VZV infection, producing the vesicular cutaneous lesions that are associated with varicella and zoster [10]. The clinical pattern of primary VZV infection is highly predictable, beginning with an incubation period of 10–21 days following a close exposure of a susceptible individual to another person with varicella or in some cases, herpes zoster [10]. Varicella often begins with a prodrome of fever, malaise, headache and abdominal pain. These initial symptoms last about 24–48 hours before skin vesicles are noted and are more common in older children and adults [11-12]. Worldwide, varicella is an endemic disease that exhibits a marked seasonal pattern in temperate climates and most temperate climates where this has been studied [13]. The objectives of this study were to evaluate the seroprevalence of varicella in different areas of Nigeria, assessing socioeconomic and demographic factors associated with seropositivity and the accuracy of clinical history of the disease.

MATERIALS AND METHODS

The study was carried out in Federal Capital Territory, Abuja; Makurdi, Benue Sate and Minna; Niger state. The study population consisted of 180 female out-patients volunteers that attend the National Hospital, Abuja, Federal Medical Centre Makurdi, Benue State and General Hospital, Minna, Niger State.

This cross sectional study was carried out to identify seroprevalence of VZV in different age groups. Subjects were checked for inclusion and exclusion criteria, a questionnaire was completed including background and family history of varicella. The exclusion criteria were; acute infectious disease, recent administration of immunoglobulin, blood products or immunosuppressive therapy [15].

SAMPLE COLLECTION AND ANALYSIS

Using a sterile disposable syringe, five milliliters (5ml) of venous blood was drawn from volunteers. The blood samples were centrifuged at 1500 rpm for two minutes; sera were separated and stored at -20ºC until tested (Bartoloni et al., 2001). The sera were tested for the presence of VZV IgG antibodies using a commercial IgG enzyme-linked immunosorbent assay (ELISA) Kit.

Manufactured by DIAGNOSTIC AUTOMATION, INC. USA , which according to manufacturer has a sensitivity of 90.9% and a specificity of 100%.

Sera were classified as negative if the OD was less than 0.90 and as positive if higher than 1.10; sera with OD reproducibly between 0.90 and 1.10 were classified as borderline (Golberg et al., 2002). The absorbance was read at 450 nm using an ELISA micro titer plate reader (Sigma Diagnostic). The presence or absence of anti-VZV-specific IgG antibodies in the test samples was calculated according to the manufacturer's instructions (Engvall and Perlmann. 1971). Results were obtained by comparing the antibody titers with the cut off values of the positive and negative controls. The statistical comparison of data was performed using the $\chi 2$ test (Bartoloni et al., 2001).

RESULT

A total of 179 serum samples collected and tested; 1 of these samples had borderline results and was not considered in the data analysis. The overall seroprevalence rate was 50.3%.

In Abuja the prevalence was 42.2%, 53.6% in Niger State and 66.7% in Benue State. Varicella IgM was 44.4% among pregnant women in their first trimester, 60.0% in the second trimester and 50.0% in the third trimester. Seroprevalence was 62.5% in the age group of 1-10 years, 52.2% in 11-20 years, 42.6% in 21-30 years, 46.5% in 31-40 years, 72.3% in 41-50 years and 38.9% in 51 years and above. There was significant relation between the presence of VZV IgM antibodies and pregnancy term, age and occupation (p=0.001). There was no significance difference between the presence of VZV antibodies and, level of education and place of residence.

Trimester	No. Screened	No. positive	% positive	95% CI
1st Trimester	18	8	44.4	24.6-66.3
2nd Trimester	30	18	60.0	42.3-75.4
3rd Trimester	26	13	50.0	32.1-67.9
Total	74	39	52.7	41.5-63.7
X^2=33.0 (P=0.001)				

Table 1. Prevalence of VZV IgM antibody by pregnancy

States	No. Screened	No. positive	% positive	95% CI
Benue	27	18	66.7	47.8-81.4
Niger	69	37	53.6	42.0-64.9
Abuja	83	35	42.2	32.1-52.9
Total	179	90	50.3	43.0-57.5
X2=4.5 (P=0.105)				

Table 2. Prevalence of VZV IgM antibody by resident

Age	No. Screened	No. positive	% positive	95% CI
1-10	16	10	62.5	38.6-81.5
11-20	23	12	52.2	33.0-70.8
21-30	54	23	42.6	30.3-55.8
31-40	43	20	46.5	32.5-61.1
41-50	25	18	72.0	52.4-85.7
>51	18	7	38.9	20.3-61.4
TOTAL	179	90	50.3	43.0-57.5
X^2=12.78(P=0.026)				

Table 3. Prevalence of VZV IgM antibody by age.

Occupation	No. Screened	No. positive	% positive	95% CI
Civil servant	40	17	42.5	28.5-57.8
Student	30	10	33.3	19.2-51.2
Trader	60	40	66.7	54.1-77.3
Farmer	10	7	70.0	39.7-89.2
HCWs	29	16	55.2	37.6-71.6
Total	179	90	50.3	43.0-57.5
X^2=20.64 (P=0.001) HCWs= Health Care Workers				

Table 4. Prevalence of VZV IgM antibody by occupation.

DISCUSSION

We found that more than just 52.7% of women attending prenatal clinics in North-Central Nigeria were immune to VZV. We did not find significant differences in seroprevalence by geographical. Varicella seroprevalence did not increase with age. The high percentage of non-immunity among adults found in this survey suggests that in Nigeria, varicella occurs during in adolescent and adults. The low seroprevalence rates found are comparable to other tropical areas. In contrast higher seroprevalence rates have been reported in temperate climates, such as Switzerland, where 96.5% of adolescents aged 13 to 15 years were immune [25], or Belgium with a reported seroprevalence of 97.2% among individuals aged 15 to 19 years [26].

Although in some studies, socioeconomic variables (e.g., social class, educational level) do not seem to help predict varicella antibody status [21-22], varicella seroprevalence has been associated with socioeconomic factors in children in Brazil and England [27-28]. Although the level of education was not related to immunity in our study, low education was a risk factor for susceptibility to varicella in Mexico [29].

Our findings may be used to guide practitioner practices aimed at preventing the occurrence of neonatal and maternal morbidity related to VZV. At this time, there is no varicella vaccination program for children or adults in place in Nigeria; however, the vaccine is available in the private sector. On the basis of our findings, physicians may assume that women of child bearing age with a positive history are immune.

The finding of this study showed that VZV seroprevalence in tropics is very low compared to the temperate regions. Significant proportions of adolescence and adults are still susceptible to varicella infection and women of child bearing age are particularly the risk group

REFERENCES

1. Whitley, R. J. (1995). Varicella-zoster virus, p. 1345–1347. In G. L. Mandell, J. E. Bennett, and R. Dolin (ed.), Mandell, Douglas, and Bennett's principles and practice of infectious diseases, 4th ed. Churchill Livingstone, New York, N.Y.

2. Guess, H. A., D. D. Broughton, L. J. Melton, and L. T. Kurkland. (1986). Population-based studies of varicella complications. Pediatrics 78:723–727.

3. Preblud, S. R. (1981). Age specific risks of varicella complications. Pediatrics 68:14–17.

4. Brunell, P. A. (1967). Varicella-zoster infection in pregnancy. JAMA 199:315- 317.

5. Brunell, P. A. (1983). Fetal and neonatal varicella-zoster infections. Semin. Perinatol. 7:47- 56.

6. Wharton, M. (1996). The epidemiology of varicella zoster virus infections. Infect Dis Clin North Ame; 10(3):571-81.

7. Lee, B. W. (1998). Review of varicella zoster seroepidemiology in India and Southeast Asia. Trop. Med. Int. Health 3:886–890.

8. Seward, J., K. Galil, and M. Wharton. (2000). Epidemiology of varicella, p. 187–205. In A. M. Arvin and A. Gershon (ed.), Varicella-zoster virus. Virology and clinical management. Cambridge University Press, Cambridge, United Kingdom.

9. Gentile, A., M. Tregnaghi, A. Manterola, O. Fay, A. Parra, P. Lamy, G. Dayan, M. Calvari, G. Grana, and R. Rutiman. (2000). Prevalencia de varicella en una poblacio´n de Buenos Aires y Crdoba. Arch. Argent. Pediatr. 98:82– 86.

10. Arvin et al, 2001a Arvin AM. Varicella-zoster virus: pathogenesis, immunity, and clinical management in hematopoietic cell transplant recipients. Biol Blood Marrow Transplant. 2000; 6: 219-230.

11. Asano-Mori Y, Kanda Y, Oshima K, et al. Long-term ultra-low-dose acyclovir against varicella-zoster virus reactivation after allogeneic hematopoietic stem cell transplantation. Am J Hematol. 2008; 83:472-476.

12. Koropchak CM, Graham G, Palmer J, Winsberg M, Ting SF, Wallace M, Prober CG, Arvin AM (1991): Investigation of varicella-zoster virus infection by polymerase chain reaction in the immunocompetent host with acute varicella. J. Infect. Dis. 163, 1016.1022.

13. Seward JF, Watson BM, Peterson CL (2002), et al. Varicella disease after introduction of varicella vaccine in the United States, 1995-2000. JAMA;287:606-611.

14. Salleras, L., A. Domı´nguez, J. Vidal, P. Plans, M. Salleras, and J. L. Taberner. 2001. Seroepidemiology of varicella-zoster virus infection in Catalonia (Spain): rationale for universal vaccination programmes. Vaccine 19:183– 188.

15. Wharton, M. (1996). The epidemiology of varicella-zoster virus infections. Infect. Dis. Clin. N. Am. 10:571–581.

16. Bartoloni, A., F. Bartalesi, M. Roselli, A. Mantella, F. Dini, E. Salazar Carballo, V. Prieto Barron, and F. Paradisi. (2001). Seroprevalence of varicella zoster and rubella antibodies among rural populations of the Chaco region, south-eastern Bolivia. Trop. Med. Int. Health 7:512–517.

17. Goldberg, J. M., H. K. Ziel, and M. A. Burchette. (2002). Evaluation of varicella immune status in an obstetric population in relation to place of birth. Am. J. Perinatol. 19:387–393.

18. Engvall, E., K. and P. Perlmann. (1971). Enzyme-Linked Immunosorbent Assay. II. Quantitative Assay of Protein Antigen, Immunoglobulin-G, By Means of Enzyme- Labelled Antigen and Antibody- Coated tubes. Biochem. Biophys. Acta. 251: 427-434.

19. Ooi, P. L., K. T. Gohn, S. Doraisingham, and A. E. Ling. (1992). Prevalence of varicella- zoster virus infection in Singapore. Southeast Asian J. Trop. Med. Public Health 23:22–25.

20. Akram, D. S., H. Qureshi, A. Mahmud, A. A. Khan, Z. Kundi, S. Shafi, N-ur-Rehman, B. Olowokure, J. Weil, H. Bock, and I. Yazdan. (2000). Seroepidemiology of varicella-zoster in Pakistan. Southeast Asian J. Trop. Med. Public Health 31:646–649.

21. Lokeshwar, M. R., A. Agrawal, S. D. Subbarao, M. S. Chakraborty, A. V. Prasad, J. Weil,

H. Bock, S. Kanwal, R. C. Shah, and N. Shah. (2000). Age related seroprevalence of antibodies to varicella in India. Indian Pediatr. 37:714–719.

22. Migasena, S., S. Simasathien, V. Desakorn, P. Benjaluck, P. Suntharasamai, P. Pitisuttitham, C. Aree, S. Naksrisook, L. Supeeranun, R. Samakoses, and F. Meurice. (1997). Seroprevalence of varicella-zoster virus antibody in Thailand. Int. J. Infect. Dis. 2:26–30.

23. Garnett, G. P., M. J. Cox, D. A. P. Bundy, J. M. Didier, and J. S. T. Catharin. (1993). The age of infection with varicella-zoster virus in St. Lucia, West Indies. Epidemiol. Infect. 110:361–372.

24. O'Grady, K. A., A. Merianos, M. Patel, and L. Gilbert. (2000). High seroprevalence of antibodies to varicella zoster virus in adult women in a tropical climate. Trop. Med. Int. Health 5:732–736.

25. Heininger, U., C. Braun-Fahrlander, D. Desgrandchamps, J. Glaus, L. Grize, P. Wutzler,

U. B. Schaad, and SCARPOL Team. (2001). Seroprevalence of varicella-zoster virus immunoglobulin G antibodies in Swiss adolescents and risk factor analysis for seronegativity. Pediatr. Infect. Dis. J. 20:775–778.

26. Thiry, N., P. Beutels, Z. Shkedy, R. Vranckx, C. Vadermeulen, M. Van Der Wielen, and P. Van Damme. (2002). The seroepidemiology of primary varicella- zoster infection in Flanders (Belgium). Eur. J. Pediatr. 161:588–593

27. Clemens, S. A. C., T. Azevedo, J. C. Fonseca, A. Cavalcante Silva, T. R. da Silveira, and

R. Clemens. (1999). Seroepidemiologia da varicela no Brasil: resultados de um estudo prospective transversal. J. Pediatr. (Rio J.). 75:433–441.

28. Pollock, J. I., and J. Golding. (1993). Social epidemiology of chickenpox in two British national cohorts. J. Epidemiol. Community Health 47:274–281.

29. Alvarez y Munoz, M. T., J. Torres, L. Damasio-Santana, A. Gomez, G. Frenandez- Quintanilla, R. Tapia-Conyer, and O. Munoz. (1999). Susceptibility to varicella-zoster infection in individuals 1 to 29 years of age in Mexico. Arch. Med. Res. 30:60.