

Original Research Article

Epidemiology of Chicken Pox Infection in Some Selected States of North-Central Nigeria

Hussaini Yusuf¹*, Murtala Eneji Salawdeen¹, Alyasau Miita Abba¹, Muhammad Usman Murtala¹, Muhammad Shamsudeen Abdullahi¹, Badaru Usman Abdulmajeed¹, Muhammad Ibrahim Ukandu¹, Ojo Olusola Festus¹, Abuyazeed Muhammad A¹

¹Department of Applied Biology and Microbiology, Federal Polytechnic, Nasarawa, Nigeria

*Corresponding author: Hussaini Yusuf

Department of Applied Biology and Microbiology, Federal Polytechnic, Nasarawa, Nigeria

Article History | Received: 17.07.2026 | Revised: 15.09.2026 | Accepted: 23.09.2026 | Published: 30.09.2026 |

Abstract: The study of chicken pox infection epidemiology was carried out in some selected states of north-central Nigeria to reveal the trend and dynamics of the aetiological viral agent called Varicella-Zoster virus transmission in relation to educational level and occupation of respondents. This was a cross-sectional hospital-based serological study that involved 750 participants resident in Benue state, Niger state and Federal Capital Territory, Abuja. About 5ml of blood samples in 750 vacutainers. Eight (8) IgG ELISA KITS and Four (4) IgM ELISA KITS- each kit equipped with all reagents needed to run an ELISA analyses of serum samples, respectively. Elisa plate reader, Micropipette and its tips, 20 liters of distilled water and hand gloves were made use of. This study revealed VZV IgG antibody prevalence in relation to educational level as 81.7%, 65.0%, 68.4%, and 73.8% for those without education, those with primary, secondary and tertiary respectively, the Chi-square analysis was (X^2) = 14.07, and the p-value was 0.0799 = $p > 0.05$. The VZV IgM antibody prevalence among those without education, primary, secondary and tertiary education was 65.6%, 47.8%, 50.9%, and 52.2% respectively, the Chi-square analysis was (X^2) = 13.7, and the p-value was 0.319 = $p < 0.05$. Prevalence of VZV IgG antibody was 73.6% for Civil servants, 58.5% among students, 74.3% among farmers, 71.7% among traders and 86.4% among health care workers (HCW), the Chi-square analysis was (X^2) = 24.60, and the p-value was 0.0062 = $p < 0.05$. While the prevalence of VZV IgM antibody was 50.6% for Civil servants, 42.2% among students, 47.1% among farmers, 48.9% among traders and 74.7% among health care workers (HCW). The overall IgM antibody prevalence was 53.2%, that of IgG was 71.70%, the Chi-square analysis was (X^2) = 11.88, and the p-value was 0.688 = $p > 0.05$.

Keywords: Chickenpox, varicella-zoster, Antibody, Prevalence.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

The causative agent of chicken pox infection is Varicella-zoster virus, it belongs the Human Herpes Virus type 3, (HHV3), which is a belongs to the genus named *Varicellovirus*, found the subfamily *Alpha-Herpesviridae* and the family *Herpesviridae*. VZV exclusively infects humans, causing two diseases: chickenpox (varicella) following primary infection and shingles (herpes zoster), which results from reactivation of latently persistent virus (Hope-Simpson, 1965). Varicella, although a relatively benign childhood infection in temperate countries, is nonetheless a cause of medically and economically important morbidity and mortality (Meyer *et al.*, 2000; Preblud, 1986). In most countries, between 2 and 4% of children are hospitalized for complications of chickenpox, including secondary bacterial infection, pneumonia and encephalitis (Sengupta *et al.*, 2008). Mortality in children is around 0

0.05 deaths per 100000 cases of chickenpox, primarily among children who were previously healthy (Sengupta *et al.*, 2008). Adult infection, which is more common in tropical countries, results in a 6-fold increase in hospitalizations and up to a 20-fold increase in deaths (Mann *et al.*, 2008; Rawson *et al.*, 2001). Herpes zoster is a major cause of morbidity in the elderly from persistent neuropathic pain (Dworkin *et al.*, 2007) and mortality in the immunocompromised, particularly from dissemination of the acute rash. The medical and economic burden of VZV disease has led to the introduction of childhood vaccination programs against varicella in Japan, North America, parts of Europe and other Asian countries (Bonanni *et al.*, 2009). More recently, a vaccine to prevent herpes zoster has been licensed and is being administered to older people in the USA (Oxman *et al.*, 2005).

Citation: Yusuf, H., Salawdeen, M. E., Abba, A. M., Murtala, M. U., Abdullahi, M. S., Abdulmajeed, B. U., Ukandu, M. I., Festus, O. O., & Muhammad, A. A. (2026). Epidemiology of Chicken Pox Infection in Some Selected States of North-Central Nigeria. *Int J Med Sci Health Innov*, 1(1), 23-27.

Persons can be infected without immediate contact with an infectious person (Aebi *et al.*, 2001; Wilson, 1986; Grose, 1981; Tyzzer, 1906). Immunocompromised persons may be contagious for a somewhat longer period of time (Vynnycky *et al.*, 2003; Adams *et al.*, 1989; Takahashi *et al.*, 1989). A shortened incubation period can be especially encountered in immunocompromised patients (Ito *et al.*, 2003; Arvin, 2001b; Haanpaa *et al.*, 2000).

METHODS

This was a prospective community based-study to reveal the incidence prevalence of serum IgM and IgG antibodies elicited by VZV infection in some selected states located in north central, Nigeria. The following states Benue State, Kwara State, Kogi State and Plateau State Niger State, Nasarawa State, and the Federal Capital Territory Abuja are located in the North-central Nigeria. Samples for this prospective study were obtained from the Federal Capital Territory, Benue, Niger states. Samples were collected utilizing the simple random sampling method.

A total of 750 blood samples were collected from these three sample sites (Niger, Benue, and Federal Capital Territory, Abuja). About 250 blood samples were collected from each from Benue state, Niger state and the Federal Capital Territory Abuja. Information on respondents was collected through questionnaires. Blood samples were collected from them by an experienced medical laboratory scientist, who was contracted for the duration of sample collection. The subject's blood samples were collected intravenously using 5ml syringes, poured into sterile tubes, then centrifuged according to the manufacturer's instruction. The blood cells separated to the bottom of the tube and the serum fraction was at the top. Elisa plate reader, Micropipette

and its tips, 20 liters of distilled water and hand gloves were utilized.

A micro well plate was opened, the first well was used for blank A-i, A-2 and A-3 for two calibrators, while A-4 and A-S were used for positive and negative controls respectively. About 100 ul of serum diluents was added to reagent blank well (A-I) and to every other well. About 8ul of calibrator, positive and negative test sera were added to the appropriate wells. To wells 6 to 96 were added 8ul of patients' sera. The micro well plate was incubated at room temperature for twenty-two (22) minutes. Liquids from all wells were aspirated, thereafter 250ul of diluted wash buffer was added to each well; this procedure was repeated five (5) times. After the final wash, the plates were blotted on tissue paper to remove all liquid from the wells. About 100ul of conjugate was applied to each well likewise the blank well. Conjugates binds the antigen antibody complex formed; plates were incubated for twenty-two minutes on the work bench. Wells in the plates were thoroughly rinsed and 100ul of chromogen /substrate solution was applied to each well including the blank well. Blue color was formed in wells after their addition; which may be due to the fact that a specific antibody to the antigen was present in the patient's serum. An ELISA plate reader was blanked on air, the reference filter was set to a wavelength of 450nm. After the addition of stop solution, the wells develop yellow coloration whose intensities varied. The color intensity of the mixture should be directly proportional to the concentration of the antibody (IgG) in the parent's serum. The developed color was read using the ELISA plate reader, the result was printed Out by a printer attached to the ELISA machine.

RESULTS

Table 1: Prevalence of VZV IgG and IgM antibodies in relation to educational level in part of North-Central Nigeria

IgG Prevalence				IgM Prevalence			
	No.	No.	%		No.	No.	%
Education	Screened	Pos.	Pos.	Resident	Screened	Pos.	Pos.
None	115	94	81.7	None	61	49	65.6
Primary	143	93	65.0	Primary	67	32	47.8
Secondary	212	145	68.4	Secondary	110	56	50.9
Tertiary	279	206	73.8	Tertiary	138	72	52.2
Total	750	538	71.7	Total	376	200	53.2

$$X^2 = 14.07, (0.0799 = p > 0.05); x^2 = 13.7, (0.319 = p < 0.05)$$

Table 2: Seroprevalence of VZV Serum IgG and IgM antibodies by occupation in North-Central Nigeria

IgG Prevalence				IgM Prevalence			
Occupational	No.	No.	%	Occupational	No.	No.	%
Status	Screened	Pos.	Pos.	Status	Screened	Pos.	Pos.
Civil servant	182	134	73.6	Civil servant	85	43	50.6
Student	171	100	58.5	Student	84	38	45.2
Farmer	167	124	74.3	Farmer	85	40	47.1
Trader	127	91	71.7	Trader	47	23	48.9
HCWs	103	89	86.4	HCWs	75	56	74.7
Total	750	538	71.7	Total	376	200	53.2

$$X^2 = 24.60, (0.0062 = p < 0.05); x^2 = 11.88, (0.688 = p > 0.05); HCWs = Health care workers$$

DISCUSSION

This study evaluated VZV IgG and IgM antibody seroprevalence of the circulating VZV in parts of North Central Nigeria. Samples for this cross-sectional study were collected from Benue and Niger states, and, the Federal capital territory Abuja. Out of the 750 blood samples screened for IgG and IgM antibodies, this investigation revealed that Benue state had the lowest IgG antibody prevalence of 49.6% compared to a higher prevalence of 79.6% for Niger and the highest prevalence of 86% for FCT, Abuja. The differences described may be attributed to the multiplicity of the inhabitants in FCT, Abuja and Niger for their high VZV antibody prevalences. This finding is similar to an Indian report of marked differences in susceptibility in different communities within a region (Arvin *et al.*, 2001). Reports from tropical countries indicated that varicella occurs in adults more frequently and apparently with severe clinical manifestations (Barzaga *et al.*, 1994). The epidemiology of varicella varies between temperate and tropical climates, though incompletely understood, these differences may relate to agent, host, environmental or a combination of these factors (Garnett *et al.*, 1993; Mandal *et al.*, 1998; Seward *et al.*, 2000; Lolekha *et al.*, 2001). In most temperate climates, >90% of persons are infected by 15 years of age with the highest incidence of disease occurring among children <10 years of age (Seward *et al.*, 2000; Wharton, 1996). In tropical climates, cases are acquired at older ages with a higher proportion of cases and higher susceptibility among adults (Lee, 1998). In temperate climates, >90% of adolescents or young adults are VZV seropositive (Seward *et al.*, 2000; Gabutti *et al.*, 2001; Thiry *et al.*, 2002; Kanra *et al.*, 2002; Kilgore *et al.*, 2003). In such countries, seroprevalence among adolescents or young adults has varied widely from less than 20% in St. Lucia (an island community in the West Indies) to >90% in tropical areas in Brazil and urban Calcutta, India (Garnett *et al.*, 1993; Barzaga *et al.*, 1994; Lee, 1998; Mandal *et al.*, 1998; Reis *et al.*, 2003).

Studies exploring reasons why the epidemiology of varicella differs between temperate and tropical climates have examined the effect of climate and population density on VZV seroprevalence (Schuchter *et al.*, 1989; Tzeng *et al.*, 1995; Veenstra *et al.*, 1996; McNulty *et al.*, 1997). In Thailand, significantly lower age-adjusted VZV seroprevalence was found in the warmer than in the cooler regions and in the warmer regions only, the age-specific seroprevalence was significantly higher in the urban population than the rural population (Fales, 1928; Lolekha *et al.*, 2001). In St. Lucia, seroprevalence for VZV was lower than for mumps, a far less infectious disease and in Singapore, which is densely populated, VZV seroprevalence among young adults has consistently been lower than in countries with temperate climates (Ooi *et al.*, 1992; Garnett *et al.*, 1993).

Mandel found that 96% of urban young adults aged 17-25 years were immune compared with 42% of similarly aged rural adults (Mandal *et al.*, 1998). In Eritrea, VZV seroprevalence among an isolated adult population was 44% compared with other adult groups in the same areas where immunity ranged from 91%- 96 (Morgan *et al.*, 2001). Urban/rural differences in varicella epidemiology are likely to be due to varying risks of exposure due to differences in population density (Locksley *et al.*, 1985, Rusthoven, 1994; Nader *et al.*, 1995). Some studies have reported that certain factors, such as physical or emotional stress and fatigue, may precipitate Herpes Zoster (HZ) outbreaks (Shaikh and Ta *et al.*, 2002). Kawai and Yawn (2017) also reported in a meta-analysis that psychological stress may predispose an individual to developing HZ.

CONCLUSION

Prevalence of IgG was found to be associated with residence, occupation, pregnancy and type of settlement, while prevalence of IgM was associated with residence, age, immune status and settlement type. This epidemiological study revealed that acquisition of education or lack of it has no bearing on the epidemiology of chicken pox infection among the study group. This study discovered that being health care worker predisposes one to be prone to contracting this virus. Civil servants' traders and farmers had high percentages of this infection.

Author's Contribution

Conceptualization: H. Y., M. E. S., and M. S. A

Methodology: A. M. A., M. U. M., M. I. U., and O. O. F.

Formal Analysis: A. M. A., H. Y., B. U. A., and M. E. S.

Writing – Original Draft: H. Y. and M. S. A.

Writing – Review & Editing: H. Y., M. E. S., and A. M. A.

REFERENCE

- Adams, S. G., Dohner, D. E., & Gelb, L. D. (1989). Restriction fragment differences between the genomes of the Oka varicella vaccine virus and american wild-type varicella-zoster virus. *Journal of medical virology*, 29(1), 38-45.
- Aebi, C., Fischer, K., Gorgievski, M., Matter, L., & Mühlemann, K. (2001). Age-specific seroprevalence to varicella-zoster virus: study in Swiss children and analysis of European data. *Vaccine*, 19(23-24), 3097-3103.
- Arvin, A. M. (1996). Varicella-zoster virus: overview and clinical manifestations. *Semin. Dermatol.*, 15(2 Suppl. 1), 4-7.
- Barzaga, N. G., Roxas, J. R., & Florese, R. H. (1994). Varicella zoster virus prevalence in metro Manila, Philippines. *I Am. Med. Assoc. (SE Asia)*, 274, S633—S635.
- Bonanni, P., Breuer, J., Gershon, A., Gershon, M., Hryniewicz, W., Papaevangelou, V., Rentier, B., Rumke, H., ... & Sadzot-Delvaux, C. (2009). Varicella vaccination in Europe - taking the practical approach. *BMC Med* 7(1), 26.

- Dworkin, R. H., Johnson, R. W., Breuer, J., Gnann, J. W., Levin, M. J., Backonja, M., Betts, R. F., Gershon, A. A., & Haanpää, M. L. (2007). Recommendations for the management of herpes zoster. *Clin Infect Dis*, 44(Suppl. 1), S1-S26.
- Fales, W. T. (1928). The age distribution of whooping cough, measles, chickenpox, scarlet fever and diphtheria in various areas in the United States. *Am. J Hyg.*, 8, 759—799.
- Gabutti, G., Penna, C., Rossi, M., Salmaso, S., Rota, M. C., Bella, A., ... & TUDY, T. H. S. E. S. (2001). The seroepidemiology of varicella in Italy. *Epidemiology & Infection*, 126(3), 433-440.
- Garnett, G. P., Cox, M. J., Bundy, D. A., Didier, J. M., & Catharine, J. S. (1993). The age of infection with varicella-zoster virus in St Lucia, West Indies. *Epidemiology & Infection*, 110(2), 361-372.
- Grose, C. (1981). Variation on a theme by Fenner: the pathogenesis of chicken pox. *Pediatrics*, 68, 735-737.
- Haanpää, M. M., & Laippala, P. P. (2000). Allodynia and pinprick hypesthesia in acute herpes zoster, and the development of postherpetic neuralgia. *Journal of pain and symptom management*, 20(1), 50-58.
- Ito, H., Sommer, M. H., Zerboni, L., He, H., Boucaud, D., Hay, J., ... & Arvin, A. M. (2003). Promoter sequences of varicella-zoster virus glycoprotein I targeted by cellular transactivating factors Sp1 and USF determine virulence in skin and T cells in SCIDhu mice in vivo. *Journal of virology*, 77(1), 489-498.
- Kanra, G., Tezcan, S., Badur, S., & Turkish National Study Team. (2002). Varicella seroprevalence in a random sample of the Turkish population. *Vaccine*, 20(9-10), 1425-1428.
- Kawai, K., & Yawn, B. P. (2017, December). Risk factors for herpes zoster: a systematic review and meta-analysis. In *Mayo clinic proceedings* (Vol. 92, No. 12, pp. 1806-1821). Elsevier. doi: 10.1016/j.mayocp.2017.10.009
- Kilgore, P. E., Kruszon-Moran, D., Seward, J. F., Jumaan, A., Van Loon, F. P., Forghani, B., ... & Hadler, S. C. (2003). Varicella in Americans from NHANES III: implications for control through routine immunization. *Journal of medical virology*, 70(S1), S111-S118.
- Lee, B. W. (1998). Review of varicella zoster seroepidemiology in India and Southeast Asia. *Trop. Med. ml. Health*, 3(11), 886-890.
- Locksley, R. M., Flournoy, N., & Sullivan, K. M. (1985). Infection with varicella-zoster virus after marrow transplantation. *J Infect. DEs.*, 152(6), 1172-1181.
- Lokeshwar, M. R., Agrawal, A., Subbarao, S. D., Chakraborty, M. S., Prasad, A. R., Weil, J., ... & Shah, N. (2000). Age related seroprevalence of antibodies to varicella in India. *Indian pediatrics*, 37(7), 714-719.
- Warachit, B. (2001). Effect of climatic factors and population density on varicella zoster virus epidemiology within a tropical country. *The American journal of tropical medicine and hygiene*, 64, 131-136.
- Mandal, B. K., Mukherjee, P. P., Murphy, C., Mukherjee, R., & Naik, T. (1998). Adult susceptibility to varicella in the tropics is a rural phenomenon due to the lack of previous exposure. *The Journal of infectious diseases*, 178(Supplement_1), S52-S54.
- Mann, M., Watson, T. L., Chaves, S. S., Civen, R., Watson, B. M., Zhang, I. X., Perella, D., Mascola, L. & Seward, I. F. (2008). Varicella among adults: data from an active surveillance project, 1995—2005. *J Infect Dis*, 197(Suppl. 2), S94-S100.
- McNulty, A., Li, Y., & Radtke, U. (1997). Herpes zoster and the stage and prognosis of HIV-1 infection. *Genitourin. Med.*, 73(6), 467-470.
- Migasena, S., Simasathien, S., Desakorn, V., Phonrat, B., Suntharasamai, P., Pitisuttitham, P., ... & Meurice, F. (1997). Seroprevalence of varicella-zoster virus antibody in Thailand. *International journal of infectious diseases*, 2(1), 26-30.
- Morgan, D., Mahe, C., Malamba, S., Okongo, M., Mayanja, B., & Whitworth, J. (2001). Herpes zoster and HIV-1 infection in a rural Ugandan cohort. *Aids*, 15(2), 223-229.
- Nader, S., Bergen, R., Sharp, M., & Arvin, A. M. (1995). Age-related differences in cell-mediated immunity to varicella-zoster virus among children and adults immunized with live attenuated varicella vaccine. *Journal of Infectious Diseases*, 171(1), 13-17.
- Ooi, P. L., Goh, K. T., Doraisingham, S., & Ling, A. (1992). Prevalence of varicella-zoster virus infection in Singapore. *The Southeast Asian journal of tropical medicine and public health*, 23(1), 22-25.
- Oxman, M. N., Levin, M. J., Johnson, G. R., Schmader, K. E., Straus, S. E., Gelb, L. D., ... & Silber, J. L. (2005). A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults. *New England Journal of Medicine*, 352(22), 2271-2284.
- Rawson, H., Crampin, A., & Noah, N. (2001). Deaths from chickenpox in England and Wales 1995-7: analysis of routine mortality data. *Bmj*, 323(7321), 1091-1093.
- Reis, A. D., Pannuti, C. S., & Souza, V. A. U. F. (2003). Prevalence of varicella-zoster virus antibodies in young adults from different Brazilian climatic regions. *Revista da Sociedade Brasileira de Medicina Tropical*, 36(3), 3-17.
- Rusthoven, J. J. (1994). The risk of varicella-zoster infections in different patient populations: a critical. *Transfus. Med. Rev.*, 8(2), 96-116.
- Shaikh, S., & Ta, C. N. (2002). Evaluation and management of herpes zoster ophthalmicus. *American family physician*, 66(9), 1723-1730.

- Schuchter, L. M., Wingard, J. R., Piantadosi, S., Burns, W. H., Santos, G. W., & Saral, R. (1989). Herpes zoster infection after autologous bone marrow transplantation. *Blood*, 74(4), 1424-1427.
- Sengupta, N., Taha, Y., Scott, F. T., Leedham-Green, M. E., Quinlivan, M., & Breuer, J. (2008). Varicellazoster-virus genotypes in East London: a prospective study in patients with herpes zoster. *J Infect Dis*, 196, 1014-1020.
- Seward, J., Galil, K., & Wharton, M. (2000). Epidemiology of varicella. In Arvin, A. and Gershon, A., eds. *Varicella-Zoster Virus*, pp. 187—205. Cambridge University Press.
- Thiry, N., Beutels, P., Shkedy, Z., Vranckx, R., Vandermeulen, C., Wielen, M., & Damme, P. (2002). The seroepidemiology of primary varicella-zoster virus infection in Flanders (Belgium). *European journal of pediatrics*, 161(11), 588-593.
- Tyzzer, E. E. (1906). The histology of the skin lesions in varicella. *Philippine I Sd.*, 1, 349-75.
- Tzeng, C. H., Liu, J. H., & Fan, S. (1995). Varicella zoster virus infection after allogeneic or autologous hemopoietic stem cell transplantation. Factors contributing to severity of herpes zoster in children. *Pediatrics*, 67(5), 763-771.
- Veenstra, J., van Praag, R.M., & Krol, A. (1996). Complications of varicella zoster virus reactivation in HI V-infected homosexual men. *AIDS*, 10(4), 393-399.
- Vynnycky, E. Gay, N. J., & Cutts, F. T. (2003). The predicted impact of private sector MMR vaccination on the burden of Congenital Rubella Syndrome. *Vaccine*, 21(21-22), 2708-2719.
- Wharton, M. (1996). The epidemiology of varicella-zoster virus infections. *Infect. Dis. Clin. North. Am.*, 10(3), 571-581.