

SJMLS - 10(1) - 016**Seroprevalence of Cytomegalovirus among Pregnant Women Attending Murtala Muhammad Specialist Hospital, Kano**

Surajo Jibrin³, Ahmad Saleh^{*1}, Lawal Dahiru Rogo², Isah Abubakar Aliyu², Jamilu Abubakar Bala², Aminu Ibrahim² and Muhammad Salihu Baba⁴

Department of Medical Laboratory Science Faculty of Health Sciences Capital City University Kano¹, Department of Medical Laboratory Science Faculty of Allied Health Sciences College of Health Sciences Bayero University Kano², Department of Laboratory Services Federal University of Health Sciences Teaching Hospital Azare³, Department of Medical Laboratory Science Faculty of Allied Health Science Baze University, Abuja⁴.

Author for Correspondence*: ahmadsalehmajiakuyam@gmail.com/+234-803-093-8189.
https://dx.doi.org/10.4314/sokjmls.v10i1.16

Abstract

Cytomegalovirus (CMV) infection is a common cause of miscarriage, growth retardation and congenital infections in pregnancy. This congenital infection can cause serious disease to the foetus such as blindness and deafness. This study determined the seropositivity of cytomegalovirus among pregnant women attending the Antenatal Clinic of Murtala Muhammad Specialist Hospital Kano. The total number of the subjects recruited for this study was 91 pregnant women and blood sample were taken from each subject. Demographic data was obtained using a pre-designed questionnaire. The samples were assayed for cytomegalovirus IgG antibody using ELISA kit. Data obtained were analyzed using SPSS version 20 using descriptive statistics, Chi-square test logistic regression at 0.05 significance level. Seventeen (79) samples out of the 91 tested positive, giving a prevalence of 86.8%. The positivity of cytomegalovirus was found to be higher among age group 26–30 with a prevalence of (35.4%) and the least CMV seroprevalence, of (5.1%) was found in the pregnant women in the age range 40–45 years. This study established no significant relationship between seropositivity of CMV and history of blood transfusion and also handling of children with deformity. This study has provided evidence of CMV infection circulation among pregnant women in the study area and therefore should be considered important in the screening and management of pregnancy to avoid the lethal effects of the virus on the foetus.

Keywords: Seroprevalence, Cytomegalovirus, Pregnant women.

Introduction

Human Cytomegalovirus (CMV) is a member of the Herpesviridae family which is recognized as human herpes virus and share morphological characteristics with other herpes viruses (Sanchez and Britt 2021). CMV infection causes serious clinical conditions and mortality in transplant patients, those with immunodeficiency and neonates (Bateman *et al.*, 2021). CMV has a world-wide distribution with recorded high prevalence in developing countries (Mhandire *et al.*, 2019). Foetal infection during pregnancy and infection in patients with Immunosuppression or organ transplantation are the most important infection caused by CMV (Leruez-Ville *et al.*, 2020).

The prevalence of CMV infection is higher in women and increase on aging (Giacconi *et al.* 2020). The primary infection caused by CMV happens in about 15–20% of pregnancies and transmitted to the foetus in up to 40% of cases (Navti *et al.*, 2021). Some of these infections lead to miscarriage, 15% lead to congenital infection with symptoms such as blindness, deafness, and 15% lead to asymptomatic infections (Pass and Arav-Boger, 2018). This study is aimed at determining the Prevalence of Cytomegalovirus among Pregnant Women Attending Murtala Muhammad Specialist Hospital Kano.

Materials and Methods**Study Area**

The study was conducted at Murtala Muhammad Specialist Hospital which is located along Kofar Mata Road at the center of Kano city in Kano Municipal Local Government, Kano State,

Nigeria. Kano State is located in the North Western part of the country between longitude 8.5°E and latitude 11.5°N; it occupies a total surface area of 20,131 km² (77,773 m²) and has a total Population of approximately 11 million. The state consists primarily of Sudan savannah type vegetation, with an annual mean rainfall of 800-900 mm, a temperature that ranges between 25-40 °C (mean approximately 26 °C), and a relative humidity of 47.43 %. The climate of the study area is a tropical dry and- wet season type typical of West African savannah. The wet season lasts from May to October, while the dry season extends from November to April (Barau, 2016).

Blood Sample Collection

About five milliliters (5ml) of venous blood sample was collected from each participant using a sterile blood collection kit, the Sample was delivered into Plain tube and was allowed to clot and then centrifuged at 3500 rpm for 5minutes. The serum was transferred into label serum containers and stored at -70°C until assay.

Sample Analysis

Serum sample was assayed for Cytomegalovirus antibody (IgG), using the CMV antibody ELISA KIT (Melsin Medical Co. Limited, China).

Assay Procedure

All reagents were prepared accordingly before starting the assay. 50ul of the Positive and Negative Controls were added separately in their respective wells. 10ul of samples were added separately to each well and 40ul of sample diluents was placed in each of the test well; blank not included. Each well was added 100ul of HRP-conjugate reagent, covered with an adhesive strip and incubated at 37°C for 60 minutes. Each well was aspirated and washed for five washes. 50ul of Chromogen solution A and 50ul of Chromogen solution B were added to each well, gently mixed and incubated for 15 minutes at 37°C protected from light. 50ul of stop solution was placed in each well and the optical density (O.D) was read and 450nm using a microtiter plate reader.

Statistical Analysis

Data obtained was subjected to descriptive statistical analysis using SPSS version 20.0 Chi-

square, was used to determine association and values obtained were considered statistically significant at $p < 0.05$ at 95% confidence interval.

Results

Ninety-one (91) pregnant women were recruited into this study. The overall prevalence of CMV IgG was found to be 86.8%. Majority of the pregnant women, 35(38.5%) were aged 26-30 years, 35(38.5%) were self-employed, 26(28.5%) had secondary and 13(14.2%) had Tertiary education respectively. Analyses of the distribution of CMV IgG seropositivity with age showed pregnant women aged 26 – 30 years had the highest CMV IgG Seroprevalence of (35.4%) and the least CMV seroprevalence, of (5.1%) was found in the pregnant women in the age range 40– 45 years.

Table 1 shows the socio-demographic characteristics of the participants. The majority of the participants (32.9%) had primary education, 28.2% secondary, 14.2% tertiary and 24.1% had no formal education. They were predominantly unemployed (47.2%) with civil servants constituting 14.2%, and 38.5% were self-employed of the 91 pregnant women.

Table 2 shows the overall prevalence of CMV IgG out of 91 pregnant women was found to be 86.8%.

In table 3, Analysis of the distribution of CMV IgG seropositivity based on age showed that pregnant Women in the aged 26 – 30 years had the highest CMV IgG seroprevalence (35.4%) closely followed by those aged 31-35 (24.1%) and 21-25 years with 22.8% also age group has CMV IgG seroprevalence of (12.7%) and the least CMV IgG seroprevalence of 5.1% was found in the Pregnant Women in the range 41 – 45years. There was no statistically significant difference of IgG seroprevalence in the different age groups ($P = 0.432$). Table 4 and table 5 present the Seroprevalence of CMV IgG in relation to possible risk factors. Different risk factors were analyzed to assess association with CMV IgG serostatus the study participants CMV IgG seropositivity was found in all those pregnant women with history of blood transfusion of about (50.6%) and without any history of blood transfusion (49.4%). However, there was no correlation observed between the viral IgG

seroprevalence and history of blood transfusion (P = 0.967). And with those exposed to child with deformities of about (13.9%) There was no

statistically significant difference of IgG seroprevalence in those pregnant women with history of exposure to child with deformities (p=0.800).

Table 1: Socio-demographic characteristics of the Participants

Variables	Frequency (n=91)	Percentage (%)
Age Groups		
21 – 25	21	23.1
26 – 30	35	38.5
31 – 35	21	23.1
36 – 40	10	10.9
41-45	04	4.39
Total	91	100
Educational level		
None	22	24.1
Primary	30	32.9
Secondary	26	28.5
Tertiary	13	14.2
Total	91	100
Occupation		
Unemployed	43	47.2
Civil servant	13	14.2
Self employed	35	38.5
Total	91	100

Table 2: Sero-prevalence of CMV IgG among pregnant women

Parameter	Number of samples	Number of positives	Prevalence (%)
CMV IgG	91	79	86.8*

*The overall prevalence of CMV IgG among the Study participants in the study area was found to be 86.8%

Table 3. Sero-prevalence of CMV IgG according to age group

Age group	Positive (n, %)	Negative (n/%)	Total (n/%)	P- value*
21-25	18 (22.8)	3 (25.0.)	21 (23.1)	0.432
26-30	28 (35.4)	7 (58.3)	35 (38.5)	
31-35	19 (24.1)	2 (16.7)	21 (23.1)	
36-40	10 (12.7)	0 (0.0)	10 (11.0)	
41-45	4 (5.1)	0 (0.0)	4 (4.4)	
Total	79 (100)	12 (100)	91 (100)	

Key: n = Frequency, % = Percentage, P < 0.05 is statistically significant, *Fisher exact test

Table 4: Seroprevalence of CMV IgG in relation to Blood Transfusion

CMV IgG Based on History of Blood Transfusion	Positive (n/%)	Negative (n/%)	Total (n/%)	P- value*
Yes	40 (50.6)	6(50.0)	46 (50.5)	0.967
No	39 (49.4)	6 (50.0)	45 (54.9)	
Total	79 (100%)	12 (100)	91 (100)	

Key: n = Frequency, % = Percentage, P < 0.005 is statistically significant, *Chi square test

Table 5: Seroprevalence of CMV IgG in relation to risk of having children with deformities

CMV IgG associated with Children with Deformities	Positive (n/%)	Negative (n/%)	Total (n/%)	P- value
Yes	11(13.9)	2 (16.7)	13 (14.3)	0.800
No	68(86.1)	10 (83.3.2)	78 (85.7)	
Total	79(100)	12 (100)	91 (100)	

Key: n = Frequency, % = Percentage, P < 0.005 is statistically significant, *Chi square test

Discussion

The seropositive rate of CMV IgG reported in this study (86.8%) is similar to prevalence rates observed in previous studies carried out with similar approach, 91.1% in Kano (Hamid *et al.*, 2014) and 97.2% in Lagos (Akinbami *et al.*, 2011). In another study in Nigeria reported 11.1% CMV IgM positive while 93.9% were positive for CMV IgG among HIV seropositive pregnant women (Fowotade *et al.*, 2015). A similar finding was also reported in Ghana, a 100% prevalence of CMV IgG among tested 172 pregnant women (Völker *et al.*, 2017). In Namibia 100% prevalence of CMV IgG and a 3.2% CMV IgM was documented (Van der *et al.*, 2019).

The prevalence of CMV IgG in this study was shown to vary with age. It ranged from 22.8% among those aged 21 - 25 years to 24.1% among those aged 31 -35 years and 35.4% among age 26-30 years. This result is in contrast with the reports from Benue (Umeh *et al.*, 2015) which recorded 100% seropositivity among those aged 41-50 years but in consonance to reports from Kaduna state (Yeroh *et al.*, 2014) which recorded a higher prevalence 90.8% in lower age groups of 25-29 Years.

A history of blood transfusion was also not found to be associated with CMV IgG seropositivity

among pregnant women (p>0.05) in this study. This may imply that previous blood transfusion is not the only risk factor for CMV infection. This outcome agrees with the findings of previous studies (Akinbami *et al.*, 2009; Oladipo *et al.*, 2014). Th possible explanation is that there are various routes through which CMV is transmitted including intrauterine, breastfeeding, sexual intercourse, blood transfusion, saliva, urine, feces, organs transplantation among others (Shaigan *et al.*, 2015).

A history of exposure to children with deformities was also not found to be associated with CMV IgG seropositivity among pregnant women (p>0.05) in this study. This may imply that exposure to children with deformities is not the only risk factor for CMV infection. This outcome is in consonance with the outcome of research by (Neirukh *et al.*, 2013).

Conclusions

In conclusion, a seroprevalence of CMV IgG (86.8%) was reported in this study among pregnant women although none of the studied risk factor was significantly associated with the CMV IgG prevalence. Also, in a population with very high prevalence of latent CMV infection,

maternal CMV infection during pregnancy might be a risk factor for adverse pregnancy/neonatal outcomes.

Recommendations

Based on the high prevalence recorded in this study, there is a need to adapt a CMV screening among pregnant women to prevent congenital transmission of the virus. A detailed molecular study should be conducted to know the circulating strain(s) of the virus in the study area.

Limitations of this study

Low sample size was used due to financial constraints and for this reason the research was therefore not generalized.

Conflict of interest

We wish to declare that there is no conflict of interest or opinion on the preparation and submission of this manuscript.

References

- Akinbami, A.A., Akanmu, A.S., Adeyemo, T.A., Wright, K.O., Dada, M.O. and Dosunmu, A.O. (2009). Cytomegalovirus antibodies among healthy blood donors at Lagos University Teaching Hospital. *South African Medical Journal*; **99(7)**: 528-530.
- Akinbami, A.A., Rabiun, K.A., Adewunmi, A.A., Wright, K.O., Dosunmu, A.O., Adeyemo, T.A., Adediran, A. and Osunkalu, V.O. (2011). Seroprevalence of cytomegalovirus antibodies amongst normal pregnant women in Nigeria. *International Journal of Women's Health*; **4**:423-428.
- Barau, A.S. (2016). Prospects of Coupled Human and Natural Systems (CHANS) for Sustainable Management of Historic Urban Landscapes in Kano City, Nigeria.
- Fowotade, A., Okonko, I.O., Agbede, O.O. and Suleiman, S.T. (2015). High seropositivity of IgG and IgM antibodies against cytomegalovirus (CMV) among HIV-1 seropositive patients in Ilorin, Nigeria. *African Health Sciences*; **15(1)**: 1-9.
- Giacconi, R., Maggi, F., Macera, L., Spezia, P.G., Pistello, M., Provinciali, M., Piacenza, F., Basso, A., Bürkle, A., Moreno-Villanueva, M. and Dollé, M.E. (2020). Prevalence and loads of torquetenovirus in the European mark-age study population. *The Journals of Gerontology: Series A*; **75(10)**:1838-1845.
- Hamid, K.M., Onoja, A.B., Tofa, U.A. and Garba, K.N. (2014). Seroprevalence of cytomegalovirus among pregnant women attending Murtala Mohammed specialist hospital Kano, Nigeria. *African Health Sciences*; **14(1)**:125-130.
- Leruez-Ville, M., Foulon, I., Pass, R. and Ville, Y. (2020). Cytomegalovirus infection during pregnancy: state of the science. *American Journal of Obstetrics and Gynecology*; **223(3)**:330-349.
- Mhandire, D., Duri, K., Kaba, M., Mhandire, K., Musarurwa, C., Chimusa, E., Munjoma, P., Mazengera, L., Stray-Pedersen, B. and Dandara, C. (2019). Seroprevalence of cytomegalovirus infection among HIV-infected and HIV-uninfected pregnant women attending antenatal clinic in Harare, Zimbabwe. *Viral Immunology*; **32(7)**:289-295.
- Navti, O.B., Al-Belushi, M. and Konje, J.C. (2021). Cytomegalovirus infection in pregnancy—An update. *European Journal of Obstetrics & Gynecology and Reproductive Biology*; **258**:216-222.
- Neirukh, T., Qaisi, A., Saleh, N., Rmaileh, A.A., Zahriyeh, E.A., Qurei, L., Dajani, F., Nusseibeh, T., Khamash, H., Baraghithi, S. and Azzeh, M. (2013). Seroprevalence of Cytomegalovirus among pregnant women and hospitalized children in Palestine. *BMC Infectious Diseases*; **13**:1-7.
- Oladipo, E.K., Akinpelu, O.O., Oladipo, A.A. and Edowhorhu, G. (2014). Seroprevalence of cytomegalovirus (CMV) among blood donors at Bowen University Teaching Hospital Ogbomoso. *American Journal of Medicine and Biological Research*; **2(3)**:72-75.
- Pass, R.F. and Arav-Boger, R. (2018). Maternal and fetal cytomegalovirus infection: diagnosis, management, and prevention. *F1000Research*, **7**.
- Sanchez, V. and Britt, W. (2021). Human cytomegalovirus egress: overcoming barriers and co-opting cellular functions. *Viruses*; **14(1)**:15.
- Shaiegan, M., Rasouli, M., Zadsar, M. and Zolfaghari, S. (2015). Meta-analysis of

- cytomegalovirus seroprevalence in volunteer blood donors and healthy subjects in Iran from 1992 to 2013. *Iranian Journal of Basic Medical Sciences*; **18(7)**:627.
- Umeh, E.U., Onoja, T.O., Aguru, C.U. and Umeh, J.C. (2015). Seroprevalence of cytomegalovirus antibodies in pregnant women, Benue State, Nigeria. *Journal of Infectious Disease and Therapy*; **3(242)**: doi:10.4172/2332-0877.1000242.
- Van der Colf, B.E., Van Zyl, G.U. and Mackenzie, S.B.P. (2019). Seroprevalence of cytomegalovirus among pregnant women in Windhoek, Namibia, 2016. *South African Journal of Obstetrics & Gynaecology*; **25(2)**: doi: 10.7196/sajog.1441.
- Völker, F., Cooper, P., Bader, O., Uy, A., Zimmermann, O., Lugert, R. and Groß, U. (2017). Prevalence of pregnancy-relevant infections in a rural setting of Ghana. *BMC Pregnancy and Childbirth*; **17**:1-7.
- Yeroh, M.I.C.H.A.E.L., Aminu, M. and Musa, B.O.P. (2015). Seroprevalence of cytomegalovirus infection amongst pregnant women in Kaduna state, Nigeria. *African Journal of Clinical and Experimental Microbiology*; **16(1)**:37-44.

Citation: Surajo Jibrin, Ahmad Saleh, Lawal Dahiru Rogo, Isah Abubakar Aliyu, Jamilu Abubakar Bala, Aminu Ibrahim and Muhammad Salihu Baba. Seroprevalence of Cytomegalovirus among Pregnant Women Attending Murtala Muhammad Specialist Hospital, Kano. *Sokoto Journal of Medical Laboratory Science*; **10(1)**: 147 – 152. <https://dx.doi.org/10.4314/sokjmls.v10i1.16>

Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.