

SEROPREVALENCE OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT WOMEN IN ILORIN, NORTH CENTRAL KWARA STATE

Omosigho, Omoruyi Pius*^{1, 2}, Izevbuwa, Osazee Ekundayo². Adam Hauwa³
Ugbomoiko Daniel².

¹. Department of Medical Laboratory Science, Faculty of Applied Health Sciences, Edo State University, Uzairue

². Department of Medical Laboratory Science, College of Health Sciences, Igbinedion University, Okada

³. Department of Medical Laboratory Science, Faculty of Pure and Applied Sciences, School of Basic Medical Science, Kwara State University, Malete

ABSTRACT: The transmission of Cytomegalovirus (CMV) from mother-to-child which result in congenital CMV (cCMV) infection may result to significant damage on the foetus, primary infections may also pose a higher treat causing cCMV, a notable possibility of mother-to-child transmission might be an effect of CMV reactivation during gestation amongst infected individuals. This research was done to establish the prevalence of CMV infection and associated risk factors among pregnant women in Ilorin. A Cross Sectional sampling technique was employed in selecting the study population. Semi-structured questionnaire was employed to obtain demographic information of the participants. Four hundred (400) pregnant woman who resides in Ilorin participated in the study. Five milliliters of blood from the vein were obtained from each of the participants through venipuncture technique. The blood samples were centrifuged and the serum used for qualitative analysis of cytomegalovirus IgG using direct ELISA technique. Out of the four hundred (400) pregnant women subjects, an overall distribution of 91.5% IgG CMV was found among pregnant women. From this study, the characteristics considered to be risk factors such as age, trimester level, gravidity, marital status, occupation, was statistically significant predisposing factor to cytomegalovirus IgG seroprevalence, with p-value >0.05 respectively. The high prevalence of anti-cytomegalovirus IgG antibody reported among pregnant women in this study is a reflection of CMV endemicity in the population and a course for concern. Based on the findings of this study, routine screening of IgM cytomegalovirus for pregnant women is recommended.

KEYWORDS: Seroprevalence, CMV, Pregnant women, Ilorin.

I. INTRODUCTION

Human cytomegalovirus (CMV) is a member of the species virus genus cytomegalovirus and the family of Herpesviridae. It is also referred to as human herpesvirus-5 (HHV-5). Within the Herpesviridae family, CMV belongs to a subfamily Beta herpesvirinae, cytomegaloviruses from other mammals also belongs to the subfamily [1]. Other family members can remain dormant in some cells of the host's body for an extended period of time [2]. CMV doesn't discriminate as it infects human at different ages and demographic, it can survive all weather conditions therefore lacks any epidemic patterns [3]. This virus is more prevalent in regions of low socioeconomic status such as the developing countries. Factors that enhances the prevalence of this virus include poor standard of living, maternal age more than 30 years and amongst unmarried women, ethnicity (colored people), for example, Asian women record 88% prevalent rate compared to their white counterparts with a 46% rate, illiteracy, and close proximity with young children and their toys [4][5]. Various researches has shown that sexual activities and contacts of children with their toys are the major sources of maternal CMV infection, in which the latter is the major cause of CMV in juveniles and pregnant nursing mothers, thus very important [5]. The spread of CMV from infected individuals is usually by direct exposure with bodily fluid. CMV has proven to be a source of viral infection during gravidity, parturition and through lactation. Primary maternal infection, resurfacing of CMV during pregnancy and HIV positive mothers can result in congenital CMV (cCMV) [6][7][8]. CMV persist as the prevalent cause of transfusion-acquired infections and congenital viral infection in patients. Its clinical indications can range from severe fetal damage, subclinical loss to growth, mental and motor retardation, microcephaly, hepatitis, pneumonia, enteritis to death (occasionally) due to frequent abortions. [7]

This infection has had an important effect in countries such as the United States and the United Kingdom where it was revealed to cause non-genetic deafness, sensorineural hearing loss and cerebral palsy [8]. In Nigeria, a 2008 study revealed that the IgM antibodies in breastfeeding mothers and children are 45% and 33% respectively [9]. Also amongst pregnant women in Bida, Nigeria it was reported that multigravida and primigravida have a IgG antibody prevalence of 86.1% and 77.1% respectively. Where the existence of IgM indicates recent or reactivation infection while IgG indicates previous infection. An higher risk of mother-to-child infection occurs extensively in primary infections where mothers become infected during pregnancy, usually during their first trimester and transmits to foetus which may lead to congenital disease. The transmission rate to foetus in women with secondary or reoccurring infections are usually lower [10]. However, neonates with cCMV infections resulting from a maternal infection during the first trimester present an higher risk compared to those whose mothers got infected during the third trimester. This research was aimed to determine the prevalence of Cytomegalovirus among pregnant women in Ilorin North Central Kwara State.

II. MATERIALS AND METHOD

Study Design : This is a cross sectional and epidemiological survey of Cytomegalovirus among pregnant women in Ilorin, Kwara state, North central, Nigeria.

Ethical Approval : Ethical approval was obtained from Kwara state ministry of health (MOH/KS/EU/777/215) before the commencement of sample collection. Written informed consent were sought out and obtained from each participant prior to enrolment into the study. The participants were adequately informed of their right to choose to or not to participate. All data were treated with utmost confidentiality.

Study Population : The study population was pregnant women in Ilorin, Kwara State, North Central, Nigeria. Attending Antenatal Clinic in Sobi Specialty hospital, Ajikobi Cotage Hospital, Ikolaba Cotage Hospital and Olorunshogo Cotage Hospital Ilorin Kwara State.

Specimen Collection : 5ml of venous blood sample were collected from each consenting pregnant woman by venipuncture, transferred into sterile anticoagulant-free bottle (Plain bottle), and allowed to clot. The clotted blood sample were centrifuged (3000 rpm, 5 min), and the serum (the supernatant) were transferred into cryovials bottle and stored at -20°C until required for use.

III. DATA COLLECTION

A semi structured questionnaire (Appendix C) was used to collect necessary data. The questionnaire will be administered by the researcher. The data to be obtained include socio-demographic characteristics. Data collected from the sero analysis of the collected blood samples were collated and analyzed statistically. The research instrument includes data from questionnaire, laboratory investigation (serology).

Laboratory Analysis : Samples of serum was tested for CMV-specific IgG antibodies using IgG ELISA kit. All the samples, reagents and calibrators were brought to room temperature an hour before the test. Test was carried out as specified by manufacturers.

Data Analysis : The data generated from this study were analyzed by statistical software SPSS version 16 (SPSS Inc. Chicago, Illinois) for windows. The statistical testing was used to evaluate Cytomegalovirus among pregnant women. Categorical variables were compared using the chi-square test while for comparison of continuous variables; student T- test was used. P- Value < 0.05 was taken to be statistically significant at a confidence level of 95%

IV. RESULTS

Socio-demographic characteristics

A total of 400 pregnant women of the age group of 18–40 years across the three trimesters were enrolled into this study. The mean age of the participants was 28 years with most of the respondents being married 394 (98.5%). More than half (61.5%) of these women were of average income and either in business 35.5%, full house wife 96 (24%) or civil servant 138 (34.5%). Two hundred and sixty-four (66%) of the respondents had more than two children with most of the participants residing in Ilorin 378 (94.5%), Majority of respondents were Yoruba 81%, virtually all the respondents had negative history of transfusion 90.5%.

Table 4.1: Characteristics of study participants

Characteristic	Age	No. Examined	Percentage (%)
Age (years)	18 – 25	36	9
	26 – 35	168	42
	36 – 40	196	49
Transfusion history	Positive	38	9.5
	Negative	362	90.5
Gravidity	Primigravida	136	34
	Multigravida	264	66
Gestational age	1 st trimester	44	11
	2 nd trimester	164	41
	3 rd trimester	192	48
Location	Rural	66	16.5
	Urban	334	83.5
Occupation	Civil servant	138	34.5
	House wife	96	24
	Business	142	35.5
	Farmer	4	1
	Student	22	5.5
Economic status	Low	90	22.5
	Average	246	61.5
	Good	64	16
Ethnicity	Hausa	34	8.5
	Fulani	42	10.5
	Yoruba	324	81

The values are number of participants with each characteristic.

4.2: Seroprevalence of CMV infection among pregnant women Ilorin : Table 4.2 shows that out of the 400 participants studied, 366 of them had positive (IgG) results for cytomegalovirus infection by the ELISA assay, giving a prevalence value of 91.5%, while 34 (8.5%) were negative.

TABLE 4.2: Seroprevalence of cytomegalovirus infection among pregnant women in Ilorin

Serology	Frequency	Percentage (%)
Positive	366	91.5%
Negative	34	8.5%
Total	400	100%

4.3 AGE DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT IN ILORIN, KWARA STATE.

Table 4.3 showed the age groups of the participants with cytomegalovirus antigen. age group 24-29 years (42.1%) had the highest prevalence of cytomegalovirus infection, this is followed by the age group 18-23 years (33.9%), age group 30-35 (17.5%), in which age group 36-40 (6.5%) which has the lowest prevalence.

There was statistical significance association of age groups ($p=0.000$) with seroprevalence of cytomegalovirus infection among pregnant women in Ilorin Kwara State at $p<0.05$.

Table 4.3 AGE DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT IN ILORIN, KWARA STATE.

Variables	Number of cytomegalovirus		P-value	Remarks
	Frequency N=366	% Positive		
Age group			0.000	S
18-23 YRS	124	33.9		
24-29 YRS	154	42.1		
30-35 YRS	64	17.5		
36-40 YRS	24	6.5		
Total	366	100		

KEY:

S= Significance

4.4: DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT WOMEN IN ILORIN KWARA STATE BASED ON EDUCATIONAL LEVEL

Table 4.4 shows that the rate of cytomegalovirus in Ilorin based on education level the secondary school participant (49.7%) which has the highest prevalence, followed by the tertiary participant (33.3%) and the primary school participant (10.9%), in which the non-educated has (6%) in which is the lowest prevalence.

There was statistical significance association of educational level ($p=0.000$) with seroprevalence of cytomegalovirus infection among pregnant women in Ilorin Kwara State at $p<0.05$.

4.4: Distribution of Cytomegalovirus Infection Among Pregnant Women In Ilorin Kwara State Based On Education Level

Variables	Number of hepatitis A in Ilorin		P-value	Remarks
	Frequency	% Positive		
Educational Level			0.000	S
Non-educated	22	6.0		
Primary school	40	10.9		
Secondary school	182	49.7		
Tertiary	122	33.3		
Total	366	100%		

KEY:

S= Significance

4.5: DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT WOMEN IN ILORIN KWARA STATE BASED ON TRIMESTER LEVEL.

Table 4.5 shows that the rate of cytomegalovirus in Ilorin based on trimester level the third trimester level participant (48.6%) which has the highest prevalence, followed by the second trimester level participant (39.9%) and the first trimester level participant (11.5%), in which is the lowest prevalence.

There was statistical significance association of trimester level ($p=0.000$) with seroprevalence of cytomegalovirus infection among pregnant women in Ilorin Kwara State at $p<0.000$

TABLE 4.5: Distribution of Cytomegalovirus infection among pregnant women based on trimester level.

Variables	Number of Cytomegalovirus		P-value	Remarks
	Frequency N=366	% Positive		
Trimester Level			0.000	S
First Trimester	42	11.5		
Second Trimester	146	39.9		
Third Trimester	178	48.6		
Total	366	100%		

KEY:

S= Significance

4.6: DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT WOMEN IN ILORIN KWARA STATE BASED ON GRAVIDITY.

Table 4.4 shows that the rate of cytomegalovirus in Ilorin based on gravidity the multigravida participant (64.5%) which has the highest prevalence, followed by the prigravida participant (35.5%), in which is the lowest prevalence.

There was statistical significance association of trimester level ($p=0.000$) with seroprevalence of cytomegalovirus infection among pregnant women in Ilorin Kwara State at $p<0.005$

TABLE 4.6: Distribution of Cytomegalovirus infection among pregnant women based on gravidity.

Variables	Number of Cytomegalovirus		P-value	Remarks
	Frequency N=366	% Positive		
Gravidity			0.000	S
Prigravid	130	35.5		
Multigravid	236	64.5		
Total	366	100%		

KEY:

S= Significance

4.7: DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT WOMEN IN ILORIN KWARA STATE BASED ON BLOOD TRANSFUSION.

Table 4.7 shows that the rate of cytomegalovirus in Ilorin based on previous blood transfusion the participant that are already been transfused (7.7%) prevalence rate, while those that have not been transfused (92.3%) prevalence rate.

There was statistical significance association of blood transfusion ($p=0.000$) with seroprevalence of cytomegalovirus infection among pregnant women in Ilorin Kwara State at $p<0.005$

TABLE 4.7: Distribution of Cytomegalovirus infection among pregnant women based on blood transfusion.

Variables	Number of Cytomegalovirus		P-value	Remarks
	Frequency N=366	% Positive		
Blood Transfusion			0.000	S
Yes	28	7.7		
No	338	92.3		
Total	366	100%		

KEY:

S= Significance

4.8: DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT WOMEN IN ILORIN KWARA STATE BASED ON LOCATION.

Table 4.8 shows that the rate of cytomegalovirus in Ilorin based on location the rural participant (94.5%) which has the highest prevalence, followed by the urban participant (5.5%), in which is the lowest prevalence.

There was statistical significance association of location ($p=0.000$) with seroprevalence of cytomegalovirus infection among pregnant women in Ilorin Kwara State at $p<0.005$

TABLE 4.6: Distribution of Cytomegalovirus infection among pregnant women based on location.

Variables	Number of Cytomegalovirus		P-value	Remarks
	Frequency N=366	% Positive		
Location			0.000	S
Rural	346	94.5		
Urban	236	5.5		
Total	366	100%		

KEY:

S= Significance

4.9: DISTRIBUTION OF CYTOMEGALOVIRUS INFECTION AMONG PREGNANT WOMEN IN ILORIN KWARA STATE BASED ON OCCUPATION

Table 4.9 shows that the rate of cytomegalovirus in Ilorin based on occupation the business participant (37.7%) which has the highest prevalence, followed by the civil servant participant (36.6%) and the housewife participant (20.2%), in which the student has (5.5%) in which is the lowest prevalence.

There was no statistical significance association of educational level ($p=0.040$) with seroprevalence of cytomegalovirus infection among pregnant women in Ilorin Kwara State at $p>0.05$.

TABLE 4.9: Distribution of Cytomegalovirus infection among pregnant women based on occupation.

Variables	Number of Cytomegalovirus		P-value	Remarks
	Frequency N=366	% Positive		
Occupation			0.040	NS
Business	69	37.7		
Housewife	37	20.2		
Civil Servant	67	36.6		
Student	10	5.5		
Total	183	100%		

KEY:

NS= Non-Significance

V. DISCUSSION

Cytomegalovirus is a global burden which is a major cause of numerous asymptomatic infections which leads ailments and congenital viral infection that leads to physical disabilities such as mental impediment, neurological impairment, and permanent deafness and blindness [11]. This research ensured to determine the prevalence of CMV among the pregnant attenders of ANC in Ilorin. A total of 400 pregnant women at different gestation phases were recruited for this study, after accumulating all necessary information, all the participants were screened for CMV using, IgM ELISA kit. Of the 400 pregnant women screened, 366 were seropositive for CMV, giving a prevalence of 91.5%. This result is comparable to 85% reported in Markudi by Umehet *al.*, (2015). Lesser prevalence value was reported from Malaysia and South Africa, 4.4% and 3.8% respectively [12]. The reason for difference in prevalence might be associated environmental condition or individual genetic makeup [13].

The distribution of CMV infection with respect to age was statistically significant. The age group of 24 to 29 years had the highest prevalence of 42.1%, followed by the age group of 26 to 35 years with 36.5%. The age group 18-23 years had a moderate prevalence; 33.9%. No significant age related but the result was in agreement with the previous findings of [14] in Markudi, Taraba State Nigeria who recorded the highest prevalence of 66.3% CMV among pregnant women in the age group of 28 to 31 years. The reason could be not be attributed to a particular factor; however, it could result from the high population of respondents at this age range. The distribution of infection of CMV based on gestational age was statistically significant in which the highest prevalence of CMV was observed at 3rd trimester, with prevalence of 48.6%. Those in first trimester had the least prevalence of 11.5%, Those in their second trimester constituted the second largest group with the prevalence of 39.9%. The result is in agreement with the report of highest prevalence among women in their third trimester 39.2% reason being that the women in their third trimester have low resistance and immunity to infection [15]. Contrarily, reports of low prevalence of 4.4% among pregnant women in their third trimester in Burkina Faso [16]. This may be due to the fact that at the onset of pregnancy, natural immunity is active though it gradually reduces as the pregnancy progresses [17][18].

Distribution of CMV infection based on gravidity of the participants was statistically significant. The higher prevalence CMV occurred in multigravida participants with the prevalence of 64.5%, while the primigravida had the prevalence of 35.5%. The result agreed with the previous findings of with highest prevalence among women with history of more than one pregnancy 39.2%. the reason being that the women in such category have higher rate of exposure [19][20][21]. Seroprevalence of CMV infection based on transfusion history was statistically significant. The higher prevalence of CMV was found among those with negative history of transfusion 92.3%. The remaining 7.7% constituted those with positive history of transfusion. The probable reason could be attributed to the fact that majority of the participants were never transfused and they were likely being exposed through other risk factors. Similar high prevalence was observed among non-transfused pregnant woman [22][23][24]. The distribution of CMV infection based marital status of the participants was not statistically significant. Virtually all the participant claimed to be married, this resulted in prevalence of 100%,

Therefore, divorcee, widow and others had zero prevalence. It was also noticed that majority of participants though educated but they are non-employed which could possibly account for the highest seroprevalence. The distribution of CMV infection based on education level of the participants was statistically significant. The data showed highest prevalence of CMV infection among the O level participant 49.7%, follow by those in category of graduate with prevalence of 33.3%. A moderate prevalence of 10.9% was observed among the primary leaver and the lowest prevalence among non-educated participant (6%). This observation opposes that of Umeh*et al.*, (2015) who reported high prevalence at all level of educational level. There was a strong association between the distribution of CMV infection and location of residence of the participants. Higher prevalence was observed among the rural dwellers with seroprevalence rate of 94.5%, on the other hands, the prevalence seropositive in urban area was 5.5%. Most of the women enrolled in the study are from City where there is overcrowding and congestion of settlement leading to poor hygiene and condition of living. This result agrees with the report of Mwaanza (2014). who asserted that sereoprevalence of CMV differs between countries and regions[25].

There was no significant association between employment status and CMV infection in this study. Socioeconomic status has been shown to be a risk factor for CMV infection. It is expected that people with high socioeconomic status should be able to afford better and healthy living conditions which decreases exposure to the virus, contrarily, the prevalence was a bit higher among the civil servants 36.6%. this could be attributed to low awareness on the transmission of the infection among the elite. Business women and housewives also had prevalence of 37.7% and 20.2% respectively.

VI. CONCLUSION

The conclusion from this comprehensive research reveals the high prevalence of CMV among studied participants. Numerous factors leads to the wide spread presence of CMV in pregnant women which is encouraged by low immunity during pregnancy. This study observed that young age, third trimester and multigravidity are features that increases the risks to the virus during ancypregn. This research reveals the endemicity of CMV in Kwara State.

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