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Seroprevalence of Cytomegalovirus IgM Antibodies among Pregnant Women within Jos Metropolis

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Abstract

Cytomegalovirus (CMV) is a major public health concern throughout the world. About 15% of intrauterine CMV infections results in congenital disease at birth, while primary CMV infection occurs in 2% of all pregnancies. A study of CMV IgM antibodies was carried out amongst pregnant women within Jos Metropolis, using the Enzyme-linked Immunosorbent Assay (ELISA) CMV IgM antigen kit, structured questionnaire covering relevant areas were administered to the subjects. One hundred and eighty four pregnant women at various trimesters were enrolled in this study. Overall result, showed that thirty five 35 (19%) of the women screened were seropositive for CMV IgM antibodies. With regards to age group prevalence, subjects within 26 – 30 years age group recorded the highest prevalence rate of 7.1% ($P > 0.05$) while those aged 41 years and above had the least prevalence. Equally, there were higher seroprevalence of HCMV in the second trimester (10.9%) than the first trimester which had 1.6% seropositivity and third trimester with 6.5%. In addition, Adult pregnant women aged 20 – 34 recorded the highest prevalent rate (14.7%) ($P < 0.05$). It is concluded that there is a significant increase of CMV infection amongst the pregnant women. Since the risk of CMV intrauterine transmission increases with advance in gestation, there is need for early detection of the virus among pregnant women, while routine screening is encouraged for all women of child bearing age.

Keywords: Cytomegalovirus, Jos, Gestation, Pregnant Women.

1.0 Introduction

Cytomegalovirus (CMV) is a viral genus of the Herpes virus group. In humans it is commonly called Human Cytomegalovirus (HCMV) or Human Herpes Virus 5 (HHV-5) (Ryan and Ray 2004).Cytomegalovirus are ubiquitous Herpes viruses that are common causes of human disease.

The name for the classic cytomegalic inclusion disease derives from the propensity for massive enlargement of Cytomegalovirus-infected cells (Jawetz *et al.,* 2007). Ryan and Ray (2004) also reported that HCMV infections are frequently associated with the salivary gland, though they may be found throughout the body.

Human CMV is the most common cause of congenital malformation resulting from viral intrauterine infection in developed countries (Demmler, 1991; Gaytant *et al.,* 2003; Stagno *et al.,* 1986). Primary CMV infections occur in 0.15 to 2.0% of all pregnancies and may be transmitted to foetus in upto 40% of cases (Stagno *et al.,* 1986). Upto 15% of intrauterine CMV infection result in asymptomatic congenital birth disease at birth and 10 to 15% of those born with asymptomatic congenital CMV will develop significant clinical sequelae in infancy (Boppana *et al.,* 1992; Dahle *et al.,* 2000; Fowler *et al.,* 1997).

Human Cytomegalovirus is found throughout all geographical locations and socioeconomic groups and infects between 50% and 80% of adults in the United States as indicated by the presence of antibodies in much of the general population (Ryan

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and Ray, 2004).

Seroprevalence is age dependent: 58.9% of individuals aged 6 and over are infected with CMV while 90.8% of individuals of aged 80 and over are positive for HCMV (Staras *et al.,* 2006). Human CMV is also the virus most frequently transmitted to a developing child before birth and poses an important public health problem because of its high frequency of congenital infections, which may lead to severe abnormities. In apparent infection is common during childhood and adolescence.

HCMV infection is more widespread in developing countries and in communities with lower socioeconomic status and represents the most significant viral cause of birth defects in industrialized countries. Considering the high frequency of congenital infection and its effect in- utero on the growing child necessitates this research work.

2.0 Materials and Method

A total of one hundred and eighty four pregnant women aged 26-45 at various trimesters were enrolled in this study Pregnant women in this study were classified based on the Age and Gravid as described by Nishimural *et al.*,(1999)..All subjects screened are resident within Jos metropolis, North Central Nigeria.

2.1 Collection of Specimens

After using cotton wool soaked in 70% alcohol to disinfect the anticubital foci, 5mls of blood was collected by vein puncture and dispensed into a clean container. Sera were separated after centrifugation at 3,000 r.p.m for 10 minutes. Sera were stored at -20^0c until they were ready for use.

2.2 Test Methodology

Sera samples were screened for the presence of CMV IgM antibodies using Enzyme linked Immunosorbent Assay (ELISA) Diagnostic Antigen kit by Biotec Laboratories, United Kingdom and other accessories which were not provided with the kits.

2.3 Survey

A short structured questionnaire was used to enquire about demographic data and risk factors from the pregnant women screened.

2.4 Statistical Analysis

Statistical analysis was performed using SPSS, version 10.1 (SPSS, Chicago, IL, USA). Continuous variables were analyzed with the *t* test and categorical variables were done using Chi square test. P values of e" 0.05 were considered statistically significant.

3.0 Results

One hundred and eighty four (184) sera samples were screened for HCMV IgM antibodies, out of which 35 (19%) tested positive while 149 (81%) tested negative. Table 1 showed distribution of HCMV within the population studied, location A which is Plateau State Specialist Hospital (PSSH) recorded 20 (10.9%) seropositivity while location B- Comprehensive Health Centre Dadin Kowa (CHC) had 15 (8.2%) seropositivity ($X^2 = 0.136$, $P>0.05$) which indicates statistically insignificant within the location.

Table 1: Distribution of human cytomegalovirus (HCMV) within the population screened

	HCMV Status			
Location	Positive (%)	Negative (%)	Total	P value
C H C	15 (8.2)	69 (37.5)	84 (45.7)	0.712
P S S H	20 (10.8)	80 (43.5)	100 (54.3)	
Total	35 (19.0)	149 (81)	184 (100)	

Key: P S S H- Plateau State Specialist Hospital, C H C- Comprehensive Health Centre Dadin Kowa

Table 2 shows the distribution of HCMV with respect to age groups giving 26-30 years with the highest

prevalence (7.1%) followed by 15-20 years (4.3%), then 21-25 years (3.8%), 31-35 years (2.7%) and 36-40 years with 1.1%.

Table 2: Distribution based on age group (years)

Age Group (Years)	HCMV Status			
	Positive (%)	Negative (%)	Total	P-value
15-20	08 (4.3)	29 (15.8)	37 (20.1)	
21-25	07 (3.8)	43 (23.4)	50 (27.2)	
26-30	13 (7.1)	50 (27.2)	63 (34.3)	0.671
31-35	05 (2.7)	12 (6.5)	17 (9.2)	
36-40	02 (1.1)	12 (6.5)	14 (7.6)	
41-45	0(0)	03 (1.6)	03 (1.6)	
Total	35(19)	149 (81)	184 (100)	

Table 3 shows the distribution of HCMV infection with respect to gestational age, with 2nd Trimester recorded the highest seroprevalence of 10.9% followed by the third trimester with 6.5% and lastly first trimester with 1.6%. Table 4 represents the distribution of HCMV according to age classification. Here Adult pregnancy gives the highest seroprevalence of 14.7% followed by teenage pregnancy with 3.3% and lastly elderly with 1.1.

4.0 Discussion

Human CMV is the most common cause of congenital malformation from viral intrauterine infection in developed countries (Gaytant *et al.*, 2002). Primary CMV infection is known to occur in 0.15-2.0% of all pregnancies and may be transmitted to the foetus in up to 40% of cases (Stagno *et al.*, 1986).

From the results obtained in this study, prevalence rate showed that of the one hundred and eighty four (184) pregnant women screened, 35(19%) were seropositive for CMV (IgM) antibodies.

This could be compared to work done by Prescot *et al.*, (1996), who reported a prevalence rate of 25% in pre-school age children in Melanesia. It

Table 3: Distribution with respect to gestational age of the women

		HCMV Status			
	Trimester	Positive Subjects	Negative Subjects	Total	P value
Gestational Age In weeks	FT	3	26	29	
	% of Total	1.6	14.1	15.8	
	ST	20	64	84	
					0.238
	% of Total	10.9	34.8	45.7	
	TT	12	59	71	
	% of Total	6.5	32.1	38.6	
Total		35	149	184	
	% of Total	19	81	100	

Key: FT- First Trimester ST-Second Trimester
TT-Third Trimester

Table 4: Distribution of HCMV in relation to age variation

		HCMV Status			
Age group		Positive	Negative	Total	P value
Teenage		6	17	23	
(13-19)	% of Total	3.3	9.2	12.5	
Adult		27	117	144	
(20-34)	% of Total	14.7	63.6	78.3	0.004
Elderly		02	15	17	
(35 & above)	% of Total	1.1	8.2	9.2	
Total		35	149	184	
	% of Total	19	81	100	

however differs from work done by Munro *et al.*, (2005), who recorded a low prevalence rate of 5.5% in pregnant women in Australia.

Also Arabpour *et al.*, (2008) recorded a prevalence rate of 5.4% in women of child bearing age in Iran. Kassim *et al.*, (1987) also recorded a very high

prevalence rate of 45% from Nigerian mothers – infant pairs. However, one of the most important aspects of the epidemiology of the virus is its extreme high prevalence in both developed and developing countries (Mustakanges *et al.*, 2000). However the prevalence of CMV antibodies among women varies with geographical location, socio economic status and occupation (Jawetz et al, 2007).

Results of this study showed the highest prevalence rate of 7.1% among age group 26 – 30 years (X^2 = 3.187, P > 0.05). This result was not statistically significant, however subjects screened within this age 26-30 years falls within the sexually matured and active group (21 – 30 years) which might lead to promiscuity, hence their likelihood of being infected (Zhong and Ma, 1999).

Pregnant women in second trimester have the highest prevalence rate (10.9%), followed by third trimester (6.5%) and the first trimester (X^2 = 2.875, P > 0.05). This result is statistically insignificant but the high rates could be as a result of advancement in the foetal age, making such women careless to personal hygiene, thereby predisposing them to infection and a high risk of intrauterine transmission. (Pass, 2001).

Age variation showed the highest prevalence rate of 14.7% among Adult pregnancy women who fall between the age of 20-34 years (X^2 = 1.333, P<0.05). This result was however statistically significant, indicating that CMV is more prominent amongst the pregnant women of this age range and could be explained further since the adult pregnancy fall within the sexually active and matured age group (21-30years) which may lead to promiscuity and its resultant likelihood of infection (Zhong and Ma, 1999).

5.0 Conclusion

In conclusion, reports obtained from this study indicated the presence of Cytomegalovirus IgM antibodies amongst pregnant women, thereby indicating a current infection and a likelihood of transmission in utero. It was noted that failure to detect seroconversion in late gestation may result in failure to detect infected neonates thereby increasing rate of transmission and infection within the population. Good personal hygiene is advocated not only for pregnant women but also for those handling children and women generally to reduce the risk of transmission of the disease. Adequate provision for CMV screening should be made available in all hospitals and health care centers.

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