



Sero-Prevalence of Cytomegalovirus (IgM) Antibodies among Pregnant Women Attending Ante-natal Clinic at the General Hospital Kafanchan, Kaduna State Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors SED and UEI designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript and managed literature searches. Authors ON, BSI and MAM managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Cytomegalovirus has been implicated as one of the causes of congenital defects in babies of infected mothers. This study was therefore conducted to determine the prevalence of Human Cytomegalovirus IgM antibodies among pregnant women attending antenatal clinic at the General hospital Kafanchan Kaduna State, Nigeria. A total of 190 serum samples were collected and

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analyzed using Human Cytomegalous Virus Enzymes ImmunoAssay kits. The study revealed that 20 out of the 190 samples were positive for Human Cytomegalous Virus IgM antibodies giving an overall prevalence of 10.5%. The prevalence was found to be higher (50%) in age group 41-45 and lowest (9.2%) in age group 26-30 ($\chi^2 = 17.309$, $P = 0.004$). Though not statistically significant the prevalence was higher in multigravid (11.5%) and lower in primigravid (8.3%). More so, women in their third trimester recorded the highest prevalence (12.5%). The high prevalence of Cytomegalovirus antibodies recorded in this study suggests that it could be endemic in the area. There is therefore the need for routine screening of pregnant women and women of child bearing age for cytomegalovirus antibodies. Increased awareness to reduce infection and transmission is also recommended.

Keywords: Seroprevalence; cytomegalovirus; antenatal; multigravida; primigravida.

1. INTRODUCTION

Cytomegalovirus has been shown to be one of the causes of congenital defects in babies of infected mothers [1]. Both primary and recurrent infections can result in foetal infection. Infection has also been reported to be associated with atherosclerosis and graft rejection in heart transplant recipients [1,2]. The virus rarely causes disease unless precipitating factors are present which lower the normal resistance for the host [3].

Cytomegalovirus (CMV) are ubiquitous herpes viruses which causes disease by infecting cells of the body, multiply and makes the host cell to swell in size – hence the prefix cytomegalo; which means “an enlarged cell”. The human Cytomegalovirus is the largest double stranded DNA virus with an appropriate size of 200 nm [4-6]. The virus may be found in body secretions, such as urine, saliva, faeces, blood and blood products, breast milk, semen and cervical secretions for months to years after the infection. Infection is spread from person to person through close contact, including kissing as well as getting saliva or urine on your hands and through nose secretion. A pregnant woman who is infected may also pass the virus to her developing baby or during birth as a newborn, and through breast feeding. CMV has also been shown to spread through blood transfusion and organ transplantation [7-9].

Unborn babies of infected women with primary or recurrent infection during pregnancy are at higher risk of complication from CMV. About 7 to 10% of these babies will have symptoms at birth or will develop disabilities including mental retardation, small head size, hearing loss, and delays in development [10-13].

Other people at risk include those with weak immune system (e., persons with HIV; persons taking chemotherapy; organ transplant medicines, and those with cardiovascular disease [12].

It has been estimated that in UK congenital CMV infection may account for 15% of sensori – neural hearing loss (SNHL) and 7% of cerebral palsy [17]. The incidence of congenital CMV infection in the US has been estimated to be around 1% of live birth, and rates of 0.15% to 2.2% have also been reported [12]. CMV infection is more widely spread in developing countries and in communities with lower social economic status and represents the most significant viral cause of birth defects in industrialized countries [14].

Studies have revealed that Cytomegalovirus is found throughout all geographic locations and infect between 50% and 80% of adults in the United States as indicated by the presence of antibodies in much of the general populations [14].

In Nigeria, a study conducted in 2008, reported a prevalence of 45.0% and 33% IgM antibodies among breastfeeding mothers and of the infants [15]. Similarly, Okwori et al. in a study among expectant mothers in Bida, Nigeria, reported IgG antibodies prevalence of 86.1% among multigravid women and 77.1% among primigravid women [16].

Serological screening of Cytomegalovirus (CMV) is not a routine examination among women attending antenatal clinic in General Hospital Kafanchan. More so, there is absence of information on the prevalence of the infection among pregnant women in the study area. This study was therefore conducted to determine the

prevalence of IgM antibodies among women attending antennal clinic in the study area.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in a Semi-Urban Kafancha Local Government Area, Kaduna State, North western Nigeria. The sample size was calculated using the descriptive studies formula.

2.2 Target Population

The target population was women attending antenatal clinics.

2.3 Inclusion and Exclusion Criteria

The study was for women that are pregnant attending antenatal clinic, while those that are not pregnant, and those who do not attend antenatal clinic are excluded in the study.

2.4 Sample Collection

Sample was collected from patient that give their concept. Whole blood of 2ml was collected aseptically using vacutainers.

2.5 Ethical Consideration

Ethical clearance was obtained from the Kaduna State Ministry of Health. The study was explained to the patients and informed consent was obtained before sample collection and administration of questionnaire for demographic data collection.

2.6 Sample Collection and Handling

A total of 190 blood samples (about 2mls) were collected via the ante cubital vein using sterile syringe and needle and poured into plain tubes. The blood was allowed to clot and then centrifuged at 3000 rpm for 5minutes. The sera was harvested into clean sterile bottles and stored at -20°C until analyzed. Information on the patients' age, occupation, stage of pregnancy e. t. c was obtained using structured questionnaire.

2.7 Serology

ASIA-LION Biotechnology company China Commercial Enzyme Linked immunosorbent assay (ELISA) kits specific for IgM were used according to manufacturer's instruction.

2.8 Principle

ASIA-LION IgM kit is ELISA based. Sample were incubated with mouse monoclonal antibody against human IgM bound to the solid surface for a microtitre well. Patient IgM is captured by the surface bound antibody. Unbound serum component are washed away, patient antiCMV IgM antibodies are detected and bound by an immunocomplex enzyme conjugate, consisting of CMV antigen which is conjugated to horse radish peroxidase. Unbound conjugate is removed by aspiration and washing. Substrate is then added and incubated in the presence of bound enzyme the substrate is converted to end product. The absorbance of this end product is read spectrophotometrically at 450 nm and is directly proportional to the concentration of IgM antibodies to CMV antigen present in the sample.

2.9 Statistical Analysis

Result and data from questionnaires were analysed using the SPSS (version 16 and the Pearson Chi square test at 95% confidence interval and a significance level of 0.05 was used to determine the relationships between the variables and seroprevalence rate.

2.9.1 limitations

1. Financial availability since the work was selfsponsor
2. There is need for further study to differentiate primary CMV infection from recurrent (reinfection or reactivation) by the use of IgG avidity testing.

3. RESULTS

The over roll Sero-prevalence in this studies is 10.5%. The sero-prevalence of CMV infection in relation to age was considered in this study and classified into six groups, the result shows that there was significant difference between age group and CMV infection ($\chi^2=17.309$, $df=5$, $p = 0.004$). Age group 41-45 years have the highest prevalence of 50%, while 26-30years have the lowest prevalence of 9.2%. The group 15-20, 21-25, 31-35 and 36-40 years have a prevalence of 9.5%, 9.6%, 9.5% and 16.7% respectively ($P<0.05$) (Table 1). The studies also shows there is no significant difference between marital status ($\chi^2=0.003$, $df=1$, $p = 0.953$). The single pregnant ladies have the highest prevalence than the married women with prevalence of 11.1% and 10.5% respectively ($P>0.05$) (Table 2). Further

study shows that there is no significant difference between the primigravid and multigravid ($\chi^2=0.448$, $df=1$, $p = 0.503$). Multigravid have 11.5% compare with primigravid women having 8.3% as shown in Table 3 ($P>0.05$). Further analysis of the results based on occupation shows that there is no significant difference between the various occupations ($\chi^2=0.247$, $df=4$, $p = 0.993$). According to their occupational status, farmers have the highest prevalence in this study with 12.5% followed by business women with 11.4%, Civil servants 11.1%, House wives 9.9% and students 7.7% ($P>0.05$) (Table 4). The analysis of CMV infection in relation to trimester in this study shows no significant difference statistically ($\chi^2=0.321$, $df=2$, $p= 0.852$). Women at their third trimester have the highest prevalence of 12.5% followed by the first and second trimester with prevalence of 11.1% and 9.7% respectively ($P>0.05$) (Table 5).

Table 1. The Sero-prevalence of CMV among antenatal women according to age

Age	No of samples	No of positive (%)	% prevalence
15-20	42	4	9.5
21-25	52	5	9.6
26-30	65	6	9.2
31-35	21	2	9.5
36-40	6	1	16.7
41-45	4	2	50
Total	190	20	10.5

$P = 0.004$

Table 2. The seroprevalence of CMV among antenatal women according to marital status

Marital status	No samples	No positive	% prevalence
Married	181	19	10.5
Single	9	1	11.1
Total	190	20	10.5

$P = 0.953$

Table 3. Sero-prevalence of CMV among antenatal women according to gravidity

Gravidity	No of samples	No of positive	% prevalence
Multigravid	130	15	11.5
Prigravid	60	5	8.3
Total	190	20	10.5

$P = 0.503$

Table 4. The Seroprevalence of CMV among antenatal women according to occupation

Occupatin	No of samples	No positive	% prevalence
Business	70	8	11.4
House wife	81	8	9.9
Civil servant	18	2	11.1
Farmer	8	1	12.5
Student	13	1	7.7
TOTAL	190	20	10.5

$P = 0.993$

Table 5. Seroprevalence of CMV among women attending antenatal clinic according to stage of pregnancy

Stage of pregnancy	No of samples	No positive	% prevalence
1 ST Trimester	27	3	11.1
2 ND Trimester	115	11	9.7
3 RD Trimester	48	6	12.5
Total	190	20	10.5

$P = 0.852$

4. DISCUSSION

Human Cytomegalovirus infection is more widely spread in developing countries and in low social economic status and represents the most significant viral cause of birth defect in industrialized countries. Primary CMV infection is known to occur in 0.5- 2.0% of all pregnancies worldwide and may be transmitted to fetus in 40% of all cases [14,17].

The prevalence of 10.5% was recorded in this study similar to the work that estimated the prevalence of 1- 14% in pregnant women in US and UK and 7.8% in pregnant women in Chandigarh [18]. While a lower prevalence of 5.5% among pregnant women in Australia [19,20] and 5.4% in women of child bearing age in Iran [21]. The differences in prevalence in these areas could be attributed to variation in geographical location, social-economic status, cultural factors and child bearing practices [8,22,]. The most important aspect of epidemiology of the virus is its high prevalence in both developed and developing countries [23].

Based on age group in this study, the age groups 41-45 years have a prevalence of 50% which is relatively higher than the other age groups, this

could be as a result of poor hygiene, low educational status and are mostly farmers that pre-dispose them to the virus. The age bracket 21-40 years represent the sexually mature and active adults with the tendency towards sexual promiscuity and are therefore most likely to experience higher infection [24].

According to Zhong and Ma, 1999 increase in sexual activity from adolescence into child bearing age increases the risk of infection [9,25]. This may explain the high prevalence reported in this age group 36-40 years with prevalence of 16.7% by this study.

This study reveals that multigravida women were mostly infected with 11.5% prevalence rate. This agrees with the study carried out by Okwori et al. [16] which recorded high prevalence in multigravid pregnant women [16]. Farmers, and business women both have a high prevalence of 12.5% and 11.4% respectively. This could be as a result of poor personal hygiene, the nature of their work that exposes them to contaminated soil, farming tools and close contact of person to person in the market places.

The prevalence of CMV infection in pregnant women in relation to trimester showed that subjects in their first, second and third trimesters had the prevalence of 11.1%, 9.7% and 12.5% respectively. This is not similar with the work of Okwori et al. [16] where Pregnant women in their second trimester showed the highest seroprevalence (86.2%) of Cytomegalovirus antibodies followed by third trimester category of 75.9%.[16]. Women at all stages of pregnancy could be at high risk of intrauterine transmission but those at higher risk are those who were infected within the first 20 weeks of pregnancy [10,11]. Babies born to these women in their second trimester are at risk of getting congenital CMV infection [11].

5. CONCLUSION

The result obtained from this study indicated the presence of Cytomegalovirus IgM antibodies among pregnant women in the population screened thereby indicating a current infection and a likelihood of transmission in utero. Since congenital CMV infection could be asymptomatic and symptomatic, asymptomatic children could serve as a source of infection to other children and those handling them. Infants of these infected mothers who could be asymptomatic could be monitored in case they may develop

clinical sequel and defects such as subtle growth retardation and sensor neural hearing loss as they grow in order to avoid damage to those organs.

We therefore recommend that further study be conducted to ascertain the risk factors for infection in the study area. Also, routine screening of women of childbearing age and pregnant women should be considered in the hospitals. More so, pregnant women and women of childbearing age should be educated on the consequences of CMV infection and the need for them to practice good personal hygiene to reduce the risk of infection and transmission.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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