



Research Article

Volume 18 Issue 3 - February 2020
DOI: 10.19080/JGWH.2020.18.555990

J Gynecol Women's Health

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Screening for Susceptibility to Cytomegalovirus Infection Among Pregnant Women in Yemen

Saad Al-Arnoot*, Saeed MS Alghalibi, Qais Yusuf M Abdullah and Assem Al-Thobhani

Department of Biology, Sana'a University, Yemen

Submission: February 23, 2020; Published: February 28, 2020

*Corresponding author: Saad Al-Arnoot, Department of Biology, Sana'a University, Yemen

Abstract

Background: Human Cytomegalovirus (HCMV) screening in pregnancy has not been recommended Yemeni pregnant women and most countries of the world. However, HCMV has been widely accepted as, the viral etiology with the greatest propensity for congenital transmission. Due to CMV ubiquity, seronegative women are highly susceptible to CMV infection and thus, have increased risk of maternal infections and possibly congenital transmission.

Objective: This study aimed to determine the seroprevalence of women, who are anti-CMV IgG seronegative, thus susceptible to CMV infections attending an antenatal clinic in some health centers in Hodeidah city, Tihama province, Yemen.

Methods: Five-ml venous blood was collected from each participant for serological studies, and serum samples were assayed using Electro-Chemiluminescence Immunoassay (ECLIA) technique.

Result: A total of 5 out of 384 subjects were anti-CMV IgG and IgM seronegative making a seroprevalence of 1.3%. Women who were immune/positive only for IgG were 372 (96.9%). The third group was those who had primary infection IgG (+) plus IgM (+) and this consisted of 7 (1.8 %) participants and no women had a recent primary infection IgG (-) plus IgM (-). All of the anti-CMV IgG seronegative pregnant women (100%) were unaware of CMV or the associated risks in pregnancy.

Conclusion: Findings from our evaluation indicated that many pregnant women were anti-CMV IgG seronegative and thus susceptible to maternal CMV infections. These women have a high risk of contacting primary CMV infections and might eventually pose danger to their unborn fetuses in the absence of appropriate preventive measures. Increased education about CMV infection, through public health interventions and obstetrician-pediatric counseling, is needed for all pregnant women.

Keywords: Cytomegalovirus; Susceptibility; Pregnant women; Yemen

Introduction

Human Cytomegalovirus (HCMV) is one of the causes of birth defects in children of infected mothers. Both primary and recurrent infections can lead to a fatal infection. HCMV infection has also been reported to be associated with atherosclerosis and graft rejection in heart transplant patients [1]. It rarely causes the disease unless there are precipitating factors that reduce normal resistance for the host [2]. HCMV can be found in body secretions, such as urine, saliva, feces, blood and blood products, breast milk, semen and cervical secretions for months or years after infection. Infection is transmitted from person to person through close contact, including kissing and saliva or urine on the hands and nasal discharge. A pregnant woman who is infected may also transmit the virus to her developing baby or during

delivery as a newborn and during breastfeeding. It has also been shown that HCMV spreads through blood transfusions and organ transplantation [3].

The risk of congenital infection is much higher during primary infection of the mother with a transmission rate from 30% to 40% compared to 0.15% -2.2% during reactivation and reinfection [4]. About 7-10% of babies of women who are infected with recurrent or primary infection during pregnancy will have symptoms at birth or developmental disabilities that include small head size, mental retardation, hearing loss and developmental delays [5]. It has been estimated that congenital HCMV infection in the United Kingdom can account for 7% of cerebral palsy and 15% of neurosensory hearing loss [6].

Although, the seroprevalence of anti HCMV (IgG) among the general population and pregnant women in Yemen and other developing countries is high (more than 95%) [7-9] but the risk of initial infection during pregnancy is also high, especially in the absence of awareness and knowledge about this virus and associated risk factors [10]. Therefore, this study aimed to determine the seroprevalence of women, who are anti-CMV IgG seronegative, thus susceptible to CMV infections who attending an antenatal clinic in some health centers in Hodeidah city, Tihama province, Yemen.

Materials and Methods

A cross-sectional study was collected from 384 pregnant women attending an antenatal clinic in some health centers in Hodeidah city, Tihama province, Yemen. About 5ml venous blood was collected from each participant by venipuncture, transferred into a sterile anticoagulant-free sterile bottle and allowed to clot. The clotted blood sample was centrifuged (3000rpm, 5min) and the serum was transferred into cryovials and stored at -10 to -20 °C until required for use. The serum samples were assayed for CMV-specific Immunoglobulin (Ig) IgG and IgM using Electro-

Chemiluminescence Immunoassay (ECLIA) technique on Cobas e411 analyzer (Roach Diagnostic GmbH, Mannheim, Germany). Calibration and quality control were performed according to manufacturer recommendation. The ethical clearance for this research was granted by the Biology Department, Faculty of Sciences, Sana'a University ethical committee after due process had been followed.

Result

About 304 subjects were enrolled in the study which ranges from 15 to 45 years old with a mean (SD) age of pregnant women was 25.9 (5.6) years. A total of 5 out of 384 subjects were anti-CMV IgG and IgM seronegative (susceptible) making a seroprevalence of 1.3%. Women who were immune/positive only for IgG (previous exposure) were 372 (96.9%). The third group was those who had primary infection IgG (+) plus IgM (+) and this consisted of 7 (1.8 %) participants and no women had a recent primary infection (IgG (-) plus IgM (-)). All of the anti-CMV IgG seronegative pregnant women (100%) were unaware of CMV or the associated risks in pregnancy (Table 1).

Table 1: Seroprevalence of CMV-specific IgG and IgM antibodies among respondents.

Immune Response	Number	Percentage (%)	Interpretation
IgG(+) and IgM(-)	372	96.90%	Previous exposure
IgG(+) and IgM(+)	7	1.80%	Primary infection
IgG(-) and IgM(-)	5	1.30%	Susceptible
IgG(-) and IgM(+)	0	0.00%	Recent primary infection

Discussion

To our knowledge, this is the first published report on investigating the susceptibility to Cytomegalovirus infection among pregnant women in Yemen. In this study, was that five (1.3%) of the women were susceptible to CMV. These findings were in close agreement with the previous study in Nigeria (4%) among pregnant women [11]. This group has a high risk of transmission of the virus to the fetus if infected during the pregnancy [12]. Especially with the recent publication that shows there is a high frequency of CMV DNA in abortive samples from women who lost their pregnancy (Petrov et al 2019). So, routine serologic screening of pregnant women would provide an opportunity to identify those susceptible women who can be counseled on appropriate preventive measures, especially in relation to their behavior with children, who are the major source of infection. Despite the benefit universal screening may offer, there is still no consensus in the scientific community concerning the implementation of screening, and it is not recommended by any public health system because of its cost/benefit ratio. Few countries in the world like Italy, Belgium and France do test all pregnant women for CMV. In Austria, Switzerland, Germany, and Japan, it is performed on a

specific request, whereas in the UK, the USA, and the Netherland, when there are symptoms in the mother [13].

Although the seroprevalence of primary infection among pregnant women in this study is low (1.8%), they are a critical group because the risk of congenital CMV infection is much higher during primary infection in the mother [14,15]. It would be beneficial therefore to properly inform this category of women on the need for further investigations such as ultrasonography, magnetic resonance imaging and amniocentesis to detect prenatal infection and planning of appropriate intervention such as the use of hyperimmune globulin or termination of pregnancy as an option. In the past, lack of evidence for treatment efficacy to prevent congenital CMV infection in women with primary infection has made routine maternal screening for primary infection ineffective and uneconomical. However, some published data have demonstrated that universal screening for maternal primary infection by using IgG avidity testing which can help to distinguish primary CMV infection from reactivation, and treatment with hyperimmune globulin was efficacious and cost-effective [16]. It is known that reactivation is usually associated with a very low rate of vertical transmission [4,17].

Because, there is no effective vaccine for CMV, and the routine treatment of pregnant women with hyperimmune globulin or antiviral agents to prevent congenital CMV infection is currently not recommended. Thus, primary preventive measures will constitute the mainstay of management of CMV for now. When pregnant women are targeted for primary prevention, there is evidence that CMV infection can be reduced by 80% [18]. Until vaccination against CMV becomes a reality, hygiene and health instructions on the prevention of CMV should be provided to non-immune women who are or intend to get pregnant, especially those with pre-school age children under age 5 [19].

The limitations of the current study can be explained in two aspects. Firstly, the use of CMV-specific IgM as an indicator of primary infection in this study had its limitations. A negative IgM result does not necessarily rule out a primary infection with CMV as samples collected too early in the course of a primary infection may not have detectable levels of IgM. Furthermore, CMV specific IgM may reappear during reactivation of CMV infection. It was not possible to distinguish between primary infection and reactivation in this study. Another limitation of our study was IgG avidity assay and PCR tests were not used due to financial constraints.

Conclusion

Findings from our evaluation indicated that many pregnant women were anti-CMV IgG seronegative and thus susceptible to maternal CMV infections. These women have a high risk of contracting primary CMV infections and might eventually pose danger to their unborn fetuses in the absence of appropriate preventive measures. Increased education about CMV infection, through public health interventions and obstetrician-pediatric counseling, is needed for all pregnant women.

Acknowledgment

The authors were grateful to the Department of Biology, Faculty of Science, Sana'a University, Sana'a, Yemen for supporting this research. We also acknowledge the contribution of all women in science, who support and contribute to this study.

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DOI: [10.19080/JGWH.2020.18.555990](https://doi.org/10.19080/JGWH.2020.18.555990)

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