

SHORT COMMUNICATION

Cytomegalovirus Seroprevalence Among Pregnant Women in the Region of Rabat, Morocco: a Cross-Sectional Study

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ABSTRACT

Background: Congenital CMV infection can lead to outcomes such as hearing loss and neurodevelopmental disabilities.

Methods: We retrospectively evaluated the CMV IgG seropositive rate in 200 pregnant women in the Rabat region to determine mothers' immune status and its distribution pattern. The sera were obtained from a serum bank between January and October, 2021. Questionnaires were administered to obtain information regarding the socio-demographic and clinical data of the enrollee. Maternal CMV serology was determined, using Alinity i chemiluminescence microparticle immunoassays for IgG quantitative detection.

Results: The age range was from 17 to 46 years, with a median age of 30 years (IQR 24.8 - 35) and a mean gestation of 20.4 ± 4.1 week. The seroprevalence of CMV IgG antibodies was 198 (99%), while 1% of participants were seronegative.

Conclusions: We recorded a low-risk profile for primary CMV infection during pregnancy due to the large number of seropositive women that were infected at a young age.

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KEYWORDS

cytomegalovirus, pregnant women, seroprevalence, IgG anti-CMV antibodies, Morocco

INTRODUCTION

Cytomegalovirus (CMV) is recognized as the most common and serious cause of congenital infection that leads to hearing loss and neurological impairment among newborns [1]. A congenital CMV infection can occur as a primary maternal infection or as recurrent maternal infections that result from reactivation or re-infection [1]. The transplacental transmission rate after maternal primary infection is around 32% [1]. In contrast, the congenital CMV transmission rate is less than 2% in women with reactivation and re-infection [2]. The risk of transmission increases with advancing gestation of 26%, 28%, and 65% in the first, second, and third trimesters, respectively [1]. Previous studies among women of reproductive age have shown that the

global CMV seroprevalence varies from 30% to 100% in different populations [3,4]. The highest maternal seropositivity was reported to be 70 - 100% in developing countries such as Africa [4]. Serological testing for the presence or absence of CMV antibodies is the best and most reliable way to estimate the seroprevalence of prior infection in a population. Recently, a group of clinicians, the European congenital infection initiative, suggested that “early and accurate maternal diagnosis through serological tests would enhance risk management and prevention strategies” [5].

In Morocco, no published data on the seroprevalence of CMV IgG antibodies in pregnant women is available; in addition, CMV screening for pregnant women is not mandatory in Morocco. Similarly, there is no representative data on the incidence of CMV infection in pregnant women in the Rabat region. Therefore, the burden of congenital disease remains largely unknown, and we are currently not able to quantify the risk of infection and its complications for pregnant women and their infants. This study is the first in the region and Morocco, and it will generate awareness to the community, mainly pregnant women. This study aims to assess the seroprevalence of anti-CMV IgG in pregnant women in the Rabat region of Morocco.

MATERIALS AND METHODS

This retrospective study is a secondary analysis utilizing a pre-existing serum bank from a previously published cross-sectional study on rubella seroprevalence among pregnant women in the Rabat region. The initial study was conducted from January 2021 to October 2021 at the Central Laboratory of Virology (CLV) at the Specialties Hospital of Rabat and was approved by the ethics committee (File No. 64 - 21) [6]. Questionnaires were administered to obtain information regarding the socio-demographic and clinical data of the enrollee. The sera from these women were collected, stored at -20°C at the CLV, and subsequently used to form the serum bank for this analysis. The women's sera were retrospectively evaluated in 2023 for anti-CMV IgG antibodies at the CLV.

The IgG anti-CMV antibody semi-quantitative determination was measured using the Alinity i (Abbott Diagnostics) closed-system immunoassay analyzer. Patients were classified into two categories: non-reactive (susceptible to primary infection) if their titer was below 6 AU/mL, and reactive (immune) if their titer was 6 AU/mL or higher, indicating past or acute infection.

The minimum sample size was calculated using the Kotlik formula [7] by assuming the level of acceptable error is 5% ($d = 0.05$) for the proportional variable, and the expected proportion in the population is 0.96 [8]. At the 5% Type I error rate ($\alpha = 0.05$), the minimum sample size of the survey is 60.

RESULTS

A total of 200 pregnant women were assessed for seroprevalence of CMV. This study showed that maternal CMV seroprevalence was very high; the anti-CMV IgG antibody rate reached 99% of the cases, while 1% of the subjects tested were seronegative and therefore at risk of primary CMV infection during their pregnancy. In contrast, despite 99% seropositivity in pregnant women, they are at risk of reactivation or reinfection, which can also lead to a congenital CMV infection and its consequences. Congenital CMV (cCMV)-associated sequelae can occur in infections following both primary and non-primary maternal HCMV infections [9]. Of the 198 anti-CMV IgG positive women, 97 (48.99%) had IgG levels higher than 250 AU/mL, 89 (44.94%) between 100 and 250 AU/mL and 12 (6.06%) between 6 and 99 AU/mL. The mean age of the studied subjects was 29.7 ± 6.7 years, with a range between 17 and 46 years. About half 96 (48%) of the pregnant women were between 25 and 34 years of age, 50 (25%) were between 17 - 24 years of age, and 54 (27%) were between 35 - 46 years of age. Low and middle socioeconomic status were recorded, respectively, in 60.5% and 39.5% of participants, and illiteracy and women obtaining primary education were observed in 56% of participants (Table 1).

The majority of pregnant women, 183 (91.5%), were in their second trimester, and 17 (8.5%) were in their first trimester of pregnancy. The mean gestational age was 20.4 ± 4.1 week. Moreover, 56 (28%) of the pregnant women were carrying their first pregnancy, and 144 (72%) had more than one child (multiparous). In total, 19.5% of the women had a history of 1 - 4 abortions, while 80.5 had no history. One hundred and fifty-two (76%) of the respondents had one to three children living in the same house, and 16.5% of their children had erythema. Taking promiscuity and housing condition into account, 59% of the pregnant women had siblings during their childhood who were greater than or equal to 5. In addition, 41% are currently living with more than three people per room, and 93.5% have fewer than four rooms in their homes.

DISCUSSION

There is no information about the seroprevalence of CMV infection in pregnant women in Morocco. Seroprevalence in other Moroccan studies that did not involve pregnant women was between 98% and 100% [10,11]. In the present study, we report a seroprevalence of CMV IgG antibodies of 99%, while 1% of the participants were seronegative. It has been found that the presence of maternal immunity is highly protective against congenital CMV infection. Naturally acquired immunity, due to CMV infection, leads to a 69% reduction in the risk of congenital CMV infection in future pregnancies [12], while primary infection with CMV at

Table 1. Maternal socio-demographic and clinical characteristic and consequences of multiple unhygien.

Variables	Descriptive data no (%) tested
Age groups (years)	
Mean $\pm$ SD = 29.7 $\pm$ 6.7	
Min - Max = 17 - 46	
Median; (IQR) = 30; (25 - 35)	
17 - 24	50 (25)
25 - 34	96 (48)
35 - 46	54 (27)
Place of residence	
Urban	112 (56)
Suburban	70 (35)
Rural	18 (9)
Treating physician	
General doctor	123 (61.5)
Specialist	77 (38.5)
Educational level	
Unschooling	43 (21.5)
Primary	69 (34.5)
Secondary	72 (36)
University	16 (8)
Professional activity	
Regular income	24 (12)
Irregular income	176 (88)
Social level	
Low	121 (60.5)
Mid	79 (39.5)
Marital status	
Married	200 (100)
Gestational age (days)	
Mean $\pm$ SD = 143 $\pm$ 28.9	
Min - Max = 12 - 182	
Median; (IQR) = 145; (126 - 167)	
First trimester	17 (8.5)
Second trimester	183 (91.5)
Parity	
Primiparous	56 (28)
Multiparous	144 (72)
Gestation	
1	30 (15)
1 - 3	124 (62)
> 3	42 (23)
History of abortion	
None	161 (80.5)
≥ 1	39 (19.5)

Table 1. Maternal socio-demographic and clinical characteristic and consequences of multiple unhygien (continued).

Variables	Descriptive data no (%) tested
Cesarean antecedent	
None	168 (84)
Once	29 (14.5)
≥ 2	3 (1.5)
Number of children living in the same house	
0	43 (21.5)
≥ 1	157 (78.5)
Housing condition	
Sibling during childhood ≥ 5	
Yes	118 (59)
No	82 (41)
More than 4 people/room during childhood	
Yes	81 (40.5)
No	119 (59.5)
More than 3 people/room currently	
Yes	82 (41)
No	118 (59)
≥ 4 room at home currently	
Yes	13 (6.5)
No	187 (93.5)
CMV IgG	
Non-reactive (0.9 AU/mL and 1.3 AU/mL)	2 (1)

any stage of pregnancy presents a risk for intrauterine infection, varying from 30 to 50%. However, it has been recorded that congenital infection in a seropositive mother ranges only from 0.2 to 1.5% [13].

In an international context, the seroprevalence in the current study is comparable with a review done in Africa, which ranges from 60% to 100% [4]. This, however, differs from those reported from developed countries where seroprevalence rate is lower in pregnant women such as in Belgium (30.2%) [3]. It seems that the seroprevalence of CMV infection recorded in our study was similar to that noted in other developing countries but higher than in developed countries. This difference in CMV seropositivity could be explained by lifestyle behavior and lower socioeconomic status, characterized by unhygienic contacts within the population, poor childbearing practices, a lack of awareness, poor hygienic standards and lower income [14]. Markers of lower socioeconomic class have been reported as risk factors for CMV infection [15]. In addition, it may be related to the fact that the majority of primary CMV infections mostly develop early in infancy because the increase in CMV seroprevalence is found in women at an early age [16]. All these show the ineffectiveness of the public health improvements in reducing the incidence of

infectious diseases in Morocco. Therefore, a comparison of the seroprevalence found in our study with those reported in other countries suggests that the seroprevalence of CMV infection in pregnant women in the Rabat region could be placed in a high position of endemicity. The present study has some limitations. First, the sample size was halved due to the limited resources. Second, we were unable to perform an IgG avidity test to investigate whether these constituted a past or recent infection. Even though the tendency toward reactivation and reinfection was not determined in this study, the high seropositivity could increase the risk of CMV transmission. The majority of congenital CMV infections, especially in populations with high seroprevalence, occur following non-primary maternal infections secondary to reactivation of endogenous HCMV strains or reinfections with a different virus strain [17-19]. Another drawback of this study was the failure to prospectively follow-up on a cohort of pregnant women to see if there was reactivation with possible transmission.

This study demonstrates that, in the Rabat region of Morocco, CMV infection is ubiquitous in pregnant women. These results show that the Rabat region has a low-risk profile for primary CMV infection during pregnancy due to the large number of seropositive

women. Recurrent cytomegalovirus infections are common in this population in comparison to primoinfection. Transmission to the fetus is significant following a primary maternal infection, but can also occur to a lesser degree in a previously immune mother by reactivation or reinfection. Though these do not confer full protective immunity against infection by different strains or prevent the reactivation of the latent one, there is a need to emphasize routine screening of CMV to establish the impact of CMV during pregnancy.

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The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of tables or their corresponding captions.

Declaration of Interest:

The authors declare that no conflicts of interest exist.

References:

1. Leruez-Ville M, Foulon I, Pass R, Ville Y. Cytomegalovirus infection during pregnancy: state of the science. *Am J Obstet Gynecol* 2020;223:330-349. (PMID: 32105678)
2. Davis NL, King CC, Kourtis AP. Cytomegalovirus infection in pregnancy. *Birth Defects Res* 2017;109:336-346. (PMID: 28398680)
3. Leuridan E, Ieven M, Hens N, Van Damme P. High susceptibility to cytomegalovirus infection of pregnant women in Flanders, Belgium. *Facts Views Vis Obgyn* 2012;4:76-81. (PMID: 24753893)
4. Mhandire D, Rowland-Jones S, Mhandire K, Kaba M, Dandara C. Epidemiology of Cytomegalovirus among pregnant women in Africa. *J Infect Dev Ctries* 2019;13:865-876. (PMID: 32084016)
5. Leruez-Ville M, Chatzakis C, Lillier D, et al. Consensus recommendation for prenatal, neonatal and postnatal management of congenital cytomegalovirus infection from the European congenital infection initiative (ECCI). *Lancet Reg Health Eur* 2024;40:100892. (PMID: 38590940)
6. Lamrani Alaoui H, Seffar M, Kassouati J, Zouaki A, Kabbaj H. Rubella seroprevalence among pregnant women in the region of Rabat, Morocco: a cross-sectional study. *BMJ Open* 2023;13:e067842. (PMID: 37263690)
7. Kotrlík JWKJW, & Higgins CCHCC. Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *Inf Technol learn Perform J* 2001;19:43. <https://fr.scribd.com/document/852041857/Survey-Research-Sample-Size-Cochran>
8. Hailemariam M, Mekonnen Z, Claeys G, Padalko E. Congenital Cytomegalovirus Infections: (no) Focus on Africa: A Review. *Gynecol Obstet (Sunnyvale)*, 2021;11:545. https://www.academia.edu/112018335/Congenital_Cytomegalovirus_Infections_no_Focus_on_Africa_a_Review
9. Pinninti S, Boppana S. Antiviral Treatment of Maternal and Congenital Cytomegalovirus (CMV) Infections. *Viruses* 2023;15:2116. <https://www.mdpi.com/1999-4915/15/10/2116>
10. Rezzouk B, Bouattar T, Belkadi B, et al. Characteristics and Outcomes of Cytomegalovirus Infection in Seropositive Kidney Transplant Recipients in the Era of Antiviral Prophylaxis with Valacyclovir: A Single-Center Study in Morocco. *Transpl Res Risk Manage* 2021;13:1-13. <https://www.dovepress.com/characteristics-and-outcomes-of-cytomegalovirus-infection-in-seroposit-peer-reviewed-fulltext-article-TRRM>
11. Zouaki A, Abidi K, Seffar M, et al. Cytomegalovirus reactivation among immunocompetent patients hospitalized in medical intensive care: Associated factors and consequences. *Diagn Microbiol Infect Dis* 2025;113:116967. (PMID: 40578124)
12. Xia L, Su R, An Z, Fu TM, Luo W. Human cytomegalovirus vaccine development: Immune responses to look into vaccine strategy. *Hum Vaccin Immunother* 2017;14:292-303. (PMID: 29053403)
13. Stagno S. Significance of cytomegaloviral infections in pregnancy and early childhood. *Pediatr Infect Dis J* 1990;9:763-764. (PMID: 2172906)
14. Zhang S, Hu L, Chen J, Xu B, Zhou YH, Hu Y. Cytomegalovirus Seroprevalence in Pregnant Women and Association with Adverse Pregnancy/Neonatal Outcomes in Jiangsu Province, China. *PLoS One* 2014;9:e107645. (PMID: 25211647)
15. Basha J, Iwasenko JM, Robertson P, Craig ME, Rawlinson WD. Congenital cytomegalovirus infection is associated with high maternal socio-economic status and corresponding low maternal cytomegalovirus seropositivity. *J Paediatr Child Health* 2014;50:368-372. (PMID: 24593837)
16. Lachmann R, Loenenbach A, Waterboer T et al. Cytomegalovirus (CMV) seroprevalence in the adult population of Germany. *PLoS One* 2018;13:e0200267. (PMID: 30044826)
17. Britt WJ. Human Cytomegalovirus Infection in Women with Pre-existing Immunity: Sources of Infection and Mechanisms of Infection in the Presence of Antiviral Immunity. *J Infect Dis* 2020; 221: S1-S8. (PMID: 32134479)
18. Ahlfors K, Ivarsson SA, Harris S. Secondary maternal cytomegalovirus infection-A significant cause of congenital disease. *Pediatrics* 2001; 107: 1227-1228. (PMID: 11388316)
19. Ahlfors K, Ivarsson SA, Johnsson T, Svanberg L. Primary and secondary maternal cytomegalovirus infections and their relation to congenital infection. Analysis of maternal sera. *Acta Paediatr Scand* 1982; 71:109-113. (PMID: 6291314)