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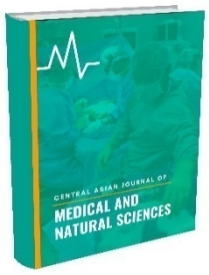

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Immunological Detection of Cytomegalovirus Infection in Pregnant Women of Al-Diwaniyah Province

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Key words: Pregnant women; Cytomegalovirus; ELISA; Prevalence .

Abstract: **Background:** Cytomegalovirus is a Herpesviridae family enveloped DNA virus. It is the most common reason for congenital infection. Cytomegalovirus infection during pregnancy can cause illness in infants. It is more common among pregnant women in undeveloped nations and among those with lower socioeconomic status.

Objective: Evaluate the prevalence of CMV infection and to identify risk factors for CMV seropositivity in pregnant women of Al-Diwaniyah Province.

Subject and methods: The study was carried out in Al-Diwaniayh province. The collection duration extended from August 2022 to November 2022. A 112 pregnant women were chosen as patient group from those attending Women's and Children's Teaching Hospital. The mean age of suspected patients was 25.86 ± 6.56 with a range of ages (15-45) years. Anti- CMV IgM and IgG antibodies were assayed by ELISA technique using (DRG kit – ELISA, USA) following the company's instructions attached.

Results: The present results show 15 (13.4%) of pregnant women was with positive results for IgM and 97 (86.6%) was negative, and the differences was highly significant (p=0.001). Whereas the IgG findings show 68 (60.7%) of pregnant women was positive and 44(39.3%) have a negative result, and the differences was highly significant (p= 0.001).

Conclusion: Cytomegalovirus antibody seroprevalence in pregnant women is high (60.7%) in Al-Diwaniayh province . A nationwide serological test for CMV antibodies is recommended for pregnant women who are at risk of CMV infection. Antenatal risk group detection is a critical step in the prevention of congenital disorders.

INTRODUCTION

Human cytomegalovirus (HCMV) has coexisted with humans for millennia and has become the most common virus worldwide. In developing countries, the infection rate of HCMV, which is species specific, is 65-80%, while it is 80-100% in developed countries among pregnant women (1,2,3) Cytomegalovirus is one of the most well-known and ubiquitous DNA viruses due to its ease to spread through our bodies' fluids and excretions. It is a member of the Herpesviridae family and the subfamily Betaherpesvirinae, which means that it, like the rest of the group, could induce latent infections and reactivate (4).CMV is a common virus that cause infection in people of all ages. It is the most prevalent cause of intrauterine infections and birth defects. It is also a major concern to immunocompromised and immunosuppressed people (5). CMV can be transmitted by saliva, breast milk, placenta, nursing, sexual contact, blood transfusion, and organ donation (6).Antibodies against CMV in bodily fluids are generally generated in response to infection, The presence of virus-specific immunoglobulin G (IgG) antibodies in the blood of a pregnant woman is required for the diagnosis of primary maternal CMV infection. It indicates a previous infection (7). CMV-specific Immunoglobulin M (IgM) is a very sensitive marker for initial infection that may be identified for many months after primary infection and may be generated upon reinfection or reactivation (8). When a primary CMV infection develops periconceptionally or during the first trimester of pregnancy, it can affect fetal development and cause serious defects, which is known as a congenital CMV infection (9). Cytomegaly in fetuses and neonates congenitally infected with HCMV can be asymptomatic or symptomatic, with severe signs such as microcephaly, ventriculomegaly, increased periventricular echogenicity, and calcifications (10). So, this study aimed The objective of the study is to evaluate the prevalence of CMV infection and to identify risk factors for CMV seropositivity.

MATEIAL AND METHODS

COLLECTION OF SAMPLE

This study was carried out in Al-Diwaniayh province. The collection duration extended from August 2022 to November 2022. A 112 pregnant women were chosen as patient group from those attending Women's and Children's Teaching Hospital . The mean age of suspected patients was 25.86 ± 6.56 with an age range of 15-45 years. Personal interviews were used to collect information such as age, abortion history, and place of residence. Three milliliters of blood were taken from pregnant women in gel test tubes by vein punctures and separated by centrifugation at 3000 rotations per minute for five minutes. Sera were kept in plane tubes and frozen until serological tests were conducted on them. Anti-CMV IgG and IgM antibodies have been detected by Enzyme -Linked Immunosorbant Assay (DRG kit – ELISA, USA). The method was carried out in accordance with the manufacturer's instructions.

STATISTICAL ANALYSIS

Data were collected, summarized, analyzed and presented using statistical package for social sciences (SPSS) version 26and Microsoft Office Excel 2010. Numeric data were presented as mean, standard deviation, range. **Independent samples t-test** was used to study difference in mean between any two groups provided that the variable is normally distributed.

RESULTS

The present results show 15 (13.4%) of pregnant women was with positive results for IgM and 97 (86.6%) was negative, and the differences was highly significant. Whereas the IgG findings show 68 (60.7%) of pregnant women was positive for IgG, and the differences was highly significant (p=0.001) ,as shown in table 1.

Table 1: Seroprevalence of IgM and IgG in pregnant women suspected with *Cytomegalovirus* infection

Pregnant Women	IgM	IgG	*P value*
Positive, *n* (%)	15 (13.4%)	68 (60.7%)	0.001 ¥ HS
Negative, n (%)	97 (86.6%)	44 (39.3%)	

¥: Chi-square test; HS: Highly significant at P ≤ 0.001.

The association between Serum IgM findings and demographic characteristics of pregnant women suspected with *Cytomegalovirus* infection.

The association between serum IgM findings and demographic characteristics was appeared in table (2). The mean age of pregnant women with positive IgM findings was 26.40 ± 5.50 and that of negative IgM findings was 25.24 ± 6.29 years. There was non-significant association between residency and serum IgM findings, (P= 0.091). The study included 5 (33.3 %) from urban area and 10 (66.7 %) from rural area in pregnant women with positive Serum IgM findings.

Table 2: Association between Serum IgM findings and demographic characteristics of patients with *Cytomegalovirus* infection.

Characteristic	Positive IgM Findings n = 15	Negative IgM Findings n = 97	*P*
Age			
Mean ± SD (years)	26.40 ± 5.50	25.24 ± 6.29	0.504 † NS
<20, *n* (%)	1 (6.7%)	19(19.6 %)	0.418 ¥ NS
20-29, *n* (%)	9 (60.0%)	56 (57.7 %)	
30-39, *n* (%)	5 (33.3%)	19 (19.6 %)	
≥ 40, *n* (%)	0	3 (3.1%)	
Residency			
Urban, *n* (%)	5 (33.3%)	55 (56.7 %)	0.091 ¥ NS
Rural, *n* (%)	10 (66.7%)	42 (43.3 %)	

n: number of cases; SD: standard deviation; †: Independent samples t-test; ¥: Chi-square test; NS: not significant at *P* > 0.05.

The association between Serum IgM findings and previous abortions in pregnant women with *Cytomegalovirus* infection.

The association between serum IgM findings and previous abortions was appeared in table (3). The present results show that there was high significant association between previous abortions and IgM findings, (P= 0.001). The study included 10 (66.7%) have previous abortion and 5 (33.3 %) don't have previous abortion in patients with positive IgM findings in compared to 15 (15.5%) of patients were negative for IgM findings that have previous abortion and 82 (84.5%) don't have previous abortion.

Table 3: Association between Serum IgM findings and previous abortions in pregnant women with *Cytomegalovirus* infection.

Characteristic	Positive IgM Findings n =15	Negative IgM Findings n = 97	P
Previous abortions			
Yes, *n* (%)	10 (66.7%)	15 (15.5 %)	0.001 ¥ HS
No, *n* (%)	5 (33.3%)	82 (84.5 %)	

n: number of cases; ¥: Chi-square test; NS: not significant at $P > 0.05$.

The association between Serum IgG findings and demographic characteristics of pregnant women with *Cytomegalovirus* infection.

The association between serum IgG findings and demographic characteristics was shown in table (4). The mean age of pregnant women with positive IgG findings was 26.38 ± 6.48 and that of negative IgG findings was 23.88 ± 5.40 years . There was significant association between residency and serum IgG findings, (P= 0.036). The study included 42 (61.8 %) from urban area and 26 (38.2 %) from rural area in pregnant women with positive serum IgG findings.

Table 4: Association between Serum IgG findings and demographic characteristics of patients with *Cytomegalovirus* infection.

Characteristic	Positive IgG findings n = 68	Negative IgG findings n = 44	P
Age			
Mean ± SD (years)	26.38 ± 6.48	23.88 ± 5.40	0.036 † S
<20, n (%)	10 (14.7%)	10 (22.7 %)	0.362 ¥ NS
20-29, n (%)	38 (55.9%)	27 (61.4 %)	
30-39, n (%)	18 (26.5%)	6 (13.6 %)	
≥ 40, n (%)	2 (2.9%)	1 (2.3%)	
Residency			
Urban, n (%)	42 (61.8%)	18 (40.9 %)	0.031 ¥ S
Rural, n (%)	26 (38.2%)	26 (59.1%)	

n: number of cases; SD: standard deviation; †: Independent samples t-test; ¥: Chi-square test; NS: not significant at $P > 0.05$.

The association between Serum IgG findings and previous abortions in pregnant women with *Cytomegalovirus* infection.

The association between serum IgG findings and previous abortions was shown in table (5). The present results show there was non-significant association between previous abortions and IgG findings, (P= 0.001). The study included 24 (35.3%) have previous abortion and 44 (64.7 %) don't have previous abortion in patients with positive serum IgG findings in compared to 1 (2.3%) of patients were negative for IgG findings that have previous abortion and 43 (97.7%) don't have previous abortion.

Table 5: Association between Serum IgG findings and previous abortions in pregnant women with *Cytomegalovirus* infection.

Characteristic	Positive IgG findings n = 68	Negative IgG findings n = 44	*P*
Previous abortions			
Yes, *n* (%)	24 (35.3%)	1 (2.3%)	0.001 ¥ S
No, *n* (%)	44 (64.7%)	43 (97.7 %)	

n: number of cases; ¥: Chi-square test; NS: not significant at $P > 0.05$.

DISCUSSION

In current research, the result showed the highest ratio of IgG seropositive in pregnant women as 68 women scored a frequency of 60.7% compared to seropositive rates of IgM 13.4%. This finding is consistent with earlier research published, in Babylon City a study discovered that IgG was identified around (95.1%) and IgM around (4.1%) among pregnant women (11). In Sulaimani city ,that presented (90.0%) of patients with IgG and (9.18%) with IgM (12). Another study in Iraq found that (41.1%) were seropositive for IgM and (61.1%) were seropositive for IgG among aborted women who were attending a teaching hospitals in Baghdad, Babylon and Al-Najaf provinces (13).

The seropositivity of CMV varies widely worldwide. In east of Iran ,a study reported that the percentage for CMV-IgG was (72.1%) and the percentage of positive CMV-IgM, Initial and recurring infection rates were 2.5% and 0.83%, respectively (14). In Al-Yemen also found (98.7%) and 7 (1.8%) were seropositive for IgG and IgM anti- CMV antibodies, respectively (15). In Durango City, Mexico, a study reported that the percentage of Anti-CMV IgG and IgM antibodies were (65.6%) and 0% of pregnant women studied, respectively (16). A study in Korea found that Cytomegalovirus seroprevalence was 95.8% for IgG and 2.4% for IgM among women of childbearing age (17).

The current study also found an increase in seropositive IgG among women living in cities. The results are in accordance with (18) who showed that the rate of IgG in aborted mother in urban area was 96% while in rural area was 4% in Karbala, Iraq. In Basra a study also found the rate of IgG in urban area increased than in rural area which was 51.4% in urban and 48.6% in rural (19). This study also agreement with other study in the world , in the city of Mwanza, Tanzania a study showed the highest rate of prevalence of IgG in urban area than rural area that it was 90.53% in urban and 43.48% in rural (20). This result in line with (21) in Taiwan also showed that the rate of cytomegalovirus increased in urban area than in rural area which was 89.9% and 86.2% , respectively. The present study's findings contradict those of (22) who found a larger percentage of anti-CMV IgG in rural areas than in urban areas in Mosul city, Iraq.

This variation in IgG antibody prevalence rate reflects differences in cultural, social, and economic level, or it is attributable to the sample size. The presence of IgG antibodies implies an ancient or chronic infection that occurred prior to pregnancy, and it is one of the most prevalent causes of congenital abnormalities caused by intrauterine infection caused by viral transfer to the fetus through the placenta and infection of the fetus (23).

On the contrary for IgM the result finding the highest prevalence of anti- HCMV IgM was in the rural area (33.3%) , while the lowest prevalence was in urban area (66.7%).The result in accordance with study in Ibb-city,Yemen which found the highest rate of IgM in rural (62.2%) while in rural was (37.8%) (24). In Croatia, a study also found the rate of CMV-IgM increased in rural than in urban , it was (4.7%) in rural area and (4.2%%) in urban area (25).Variations in IgM seroprevalences in

different studies may be related to variable sample sizes for different studies, discrepancies in test methodologies, and time of blood sample collection (26).

CONCLUSIONS

The current study found a high level of CMV IgG seropositivity among pregnant women in Al-Diwaniayh province, There was a high seroprevalence among pregnant women whom lives in urban area. This study noticed a statistically significant (P<0.022) between CMV IgG seropositivity and place of residence. Several factors, including a lack of optimal/structured antenatal and postnatal care, insufficient equipment and funding for laboratory facilities, and socioeconomic factors such as poverty, low awareness, literacy, sexually transmitted diseases, and teen pregnancies, are unacceptably predisposing Iraqi women to poor health outcomes. As a result, many countries, including Iraq, demand more knowledge and international recommendations on managing HCMV. Infection during pregnancy remains a public health priority in order to prevent congenital CMV infection. Hygiene precautions and eventually vaccination have the potential to prevent maternal and congenital CMV infection but may also have differential efficacy against primary and non-primary infections.

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