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Seroprevalence of Human Cytomegalovirus among Aborted Women in Aden, Yemen

Ali N.M. Gubran[1]

[1] *Department of Health Sciences, Faculty of Medicine and Health Sciences, University of Science and Technology, Aden, Yemen.*

ABSTRACT

Human cytomegalovirus (HCMV) is one member of Herpesviridae. It can cause serious complications in pregnant women and their fetuses. So, this study aims to determine the prevalence of IgG and IgM against HCMV among aborted women and other related factors in Aden–Yemen. An analytical cross-sectional study was conducted on 88 aborted women. Blood samples were collected and serum HCMV IgG and IgM were analyzed using ELISA. The overall prevalence of IgG and IgM of HCMV infections were 77.6% and 83.3%, respectively. Neither HCMV IgG nor IgM seroprevalence had significantly influenced by age, number of abortions, education level, trimesters, and other factors. It can be concluded that the seroprevalence IgG antibodies of HCMV infections among aborted women were slightly lower than those reported globally whereas the seroprevalence IgM antibodies were higher than most of the previous studies that performed globally. Other causative factors may also contribute to abortion among aborted women. Further research is required to detect the HCMV and other causative agents of abortion in Aden and other southern governments of Yemen using adequate sample size and new advanced techniques.

Keywords: Seroprevalence, Human cytomegalovirus, CMV, aborted women, Aden, Yemen.

***Corresponding author:** Ali N.M. Gubran - **E-mail**: Abuyafa201@yahoo.com

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Introduction

The human cytomegalovirus (HCMV), also referred to as human herpesvirus-5 (HHV-5), is one member of Herpesviridae (1). HCMV is enveloped and contains a double-stranded DNA genome (2). The virus is widespread and infects people of all ages (3). It is associated with different types of diseases that range from subclinical asymptomatic in immunocompetent individuals to severe life-threatening infections, especially among immunocompromised patients (4, 5). In healthy individuals, it causes mononucleosis infection similar to the caused by Epstein-Barr virus, it is called heterophil-negative mononucleosis while in immunocompromised patients such as those who are recipients of bone marrow and solid organ transplants, and it can cause respiratory infection as pneumonia (6). The serious complications occur in pregnant women and their fetuses (7, 8). It can cause abortion or loss of a fetus and congenital abnormalities that might lead to either fetal death or hearing loss, vision loss, and mental retardation of newborns (9). These abnormalities occur in fetuses due to transmission of the virus during pregnancy (10). HCMV is transmitted by a variety of modes where it is found in the different secretions and body fluids such as; saliva, blood, semen, cervical secretions, breast milk, tears, and urine, it can transmitted sexually, through blood transfusions and organ transplants (8). Congenital malformation of the fetus is caused by intrauterine infection with a virus (11).

In Yemen, the seropositive for CMV IgG antibodies among Yemeni blood donors was 96.6% (12) ranging from 68%-100% among pregnant women (13) and 98.67% among aborted women (14). In the southern region of Yemen especially Aden, there was no available data about the prevalence of CMV infection among aborted women in that city.

Therefore, the present study was considered the first study that dealt with this issue and it was aimed, firstly to determine the prevalence of immunoglobulins (Igs); IgG, and IgM against the HCMV among aborted women in Aden, Yemen, and, secondly to determine the number of abortions as well as associated with the transmission of HCMV among those women.

Methods

An analytical cross-sectional study was conducted on 88 aborted women attending maternity units in different hospitals in Aden, Yemen. The data was collected using a questionnaire that was predesigned previously for that purpose and the information included the age of aborted women, number of abortions, education level, and trimester of abortion, and questions about the risk factors that contribute to HCMV infection. Blood samples were collected from all women, and the serum was then separated. HCMV IgG and IgM were analyzed using enzyme-linked immunosorbent assay (ELISA). Analysis of the data was performed using SPSS® software (Version 21) and p-value ≤ 0.05 was considered statistically significant.

Results

Among the eighty-eight aborted women, the mean age was 29.4 years ±6.8 (SD). The age range was between 16 years and 45 years (Table 1).

Table 1. The age group distribution of aborted women in Aden - Yemen.

Age (years)	Aborted women	
	No.	%
≤ 25	13	26.1
25-29	13	26.1
30 -34	21	23.9
≥ 35	21	23.9
Total	88	100

The overall prevalence of IgG and IgM of HCMV infections were 68(77.6%) and 10(83.3%), respectively (Table 2). According to IgG seropositive aborted women, the prevalence rates were 17(81.0%) among those in the age group 30-

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34 years, 15(88.2%) among those women who were aborted more than three times, 11(91.7%) among those who had literate level and 58(80.6%) among those women who exposed to abortion at the first trimester. The prevalence among those who were exposed to blood transfusion and those who used corticosteroids were 12(75.0%) and 18 (75.0%) respectively. Regarding the IgM antibodies, the prevalence rate were 5(21.7%) among those in the age group 25-29 years, 2(28.6%) among those women who were aborted more than three times, 3(25.0%) among those who had literate level and 1(20.0%) among those women who exposed to abortion at the first trimester. The prevalence among those who were exposed to blood transfusion was 4(25.0%) (Table 3). Neither HCMV IgG nor IgM seroprevalence had significantly associated with age, number of abortions, education level, trimesters, and other factors.

Table 2: Seroprevalence of CMV antibodies among aborted women in Aden City, Yemen

Results	IgG positive		IgM positive		*P*-value
	No.	%	No	%	
Positive	68	77.3	10	83.3	0.592
Negative	20	22.7	2	16.7	

Discussion

Different studies showed that seropositive of IgG among aborted women was higher than our results such as in Yemen (98.7%) (14), in Sudan (97.8 %) (15), in Iraq (96%) (16), in India (92.50%) (17) in Sudan (88.9%) (18), in Iraq (89%) and in India (85%) (19, 20). Regarding seropositive of IgM, various studies showed lower rates than that found in the present study such as in Iran (20%)(17), Iraq (15.7%), (10%) and (7%) (16, 19, 21), Yemen (7%) (14), Sudan (2.2%) and (0.0%) (15, 18), on another hand, a study conducted in Iraq showed higher result than the present study which was (93%) (20). Our data was lower in seropositive of IgG than that reported among the general pregnant women in Yemen, with which the prevalent rate 98.7% whereas the seropositive of IgM was higher than that among those pregnant women which was 1.8% (13). In addition, this IgG seropositive was also lower than that reported among healthy blood donors in Yemen, in which the prevalent rate was (96.6%), but the seropositive of IgM was higher (12). The main factors contributing to the increased HCMV seroprevalence in developing countries compared to wealthy ones are traditions, poor socioeconomic status and poor hygiene practices; this explained the variations in anti-HCMV seropositive amongst those populations (14). Other factors are differences in sensitivity and sensitivity of serological methods and markers among studied groups as compared to the current study (22).

Regarding the age of the aborted women, the present study data demonstrated that women in age groups 30-39 years had the highest rate of anti-HCMV IgG antibodies. A study undertaken in Iraq, reported that the highest prevalence of anti-HCMV antibodies among aborted women was observed in the age groups 36-40 years (19). Abbas et al revealed the highest prevalence of anti-HCMV IgG in the age group 16-25 years (14). These variations may be attributed to the fact that as women become older, they interact and come into contact with more risk factors (23). The breastfeeding transmission, latency property of virus and wide practice of breastfeeding of females during infancy may contribute in seroprevalence of CMV among young females (24).

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Table 3. Seroprevalence of anti-HCMV IgG and IgM among aborted women related to different variables in Aden-Yemen

Category	IgG positive		*P-value*	IgM positive		*P-value*
	No.	%		No.	%	
Age groups/years						
<25 (n=23)	18	73.3	0.896	2	8.7	0.422
25 – 29 (n=23)	17	73.9	0.656	5	21.7	0.188
30-34 (n=21)	17	81.0	0.647	3	14.3	0.921
35 (n=21)	16	76.2	0.893	2	9.5	0.529
Number Abortion						
One (n=40)	31	77.5	0.963	2	12.5	0.776
Twice (n=24)	16	66.7	0.148	2	8.3	0.375
Third (n=17)	15	88.2	0.233	3	17.6	0.592
More than 3 (n=7)	6	85.7	0.581	2	28.6	0.233
Educational level						
Literate **(n=12)**	11	91.7	0.200	3	25.0	0.217
Primary **(n=27)**	21	77.8	0.940	2	7.4	0.257
Secondary **(n=35)**	29	82.9	0.310	7	20.0	0.157
Collage **(n=14)**	7	50.0	0.008	0	0.0	0.107
Trimesters						
1st trimester (n=72)	58	80.6	0.119	10	13.9	0.884
2nd trimester (n=11)	6	54.5	0.054	1	9.1	0.639
3rd trimester (n=5)	4	80.0	0.881	1	20.0	0.669
Risk factors						
Blood transfusion (n=16)	12	75.0	0.810	4	25.0	0.143
Use corticosteroid (n=24)	18	75.0	0.755	2	8.3	0.375

Despite, the borderline significant association between collage education level and seropositive of IgG the literate women had the highest rate in our results. Abbas et al, reported that the highest rate were found among those women who were literates and University education levels (14). It was also in agreement with the seropositive of IgM of Abbas' study which was high among those who had a literate level (14). Education, poorer socioeconomic status and hygienic practices are the most factors contributing the differences in CMV infections where the best way to prevent infection is to educate mothers and maintain good hygiene (25, 26, 27).

Similarly, Abbas et al. reported that the highest rates were among women who were exposed to second and third trimester's abortions (14). Two studies carried out in Iraq and Bangladesh showed that the highest seroprevalence of anti-HCMV IgG was among those who aborted at the second trimesters (28, 29). Additionally our result was in agreement with that reported in Yemen in which the highest rate of anti-HCMV IgM was among women who were aborted at third trimester (14). In contrast, it disagreed with that conducted in Iraq and Sudan in which the highest seropositive of IgM was observed among those women who exposed to abortion during the first trimester (18, 28). The discrepancies could be genetic and immunological backgrounds of pregnant women and their fetus. Another explanation may be time of infections of mother and fetus (30). Furthermore, the small sample size and the use of serological testing rather than molecular techniques such as Polymerase Chain Reaction (PCR) which is more accurate are considered two of important limitations of our study due to financial constraints.

Conclusion

The seroprevalence of IgG antibodies of HCMV infections among aborted women was slightly lower than those reported globally whereas the seroprevalence of IgM antibodies was higher than

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most studies performed globally. Therefore, other causative agents may also be contributed to abortion among aborted women in Aden, Yemen. Further studies are required to detect the HCMV and other causative agents of abortion in Aden and other southern governments of Yemen using adequate sample size and new advanced techniques.

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Conflict of interest

The author declare that no conflict of interest.

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