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OPEN ACCESS Original Article

Cytomegalovirus among Aborted Women in Abyan Governorate -Yemen

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ABSTRACT

Background: The cytomegalovirus can cause potentially life-threatening complications in infected pregnant women and fetuses.
Objective: This study was aimed to determine the seroprevalence of IgG and IgM against CMV among aborted women in Abyan Governorate, Yemen, and to determine the number and trimesters of abortions as well as other related risk factors that may contribute to transmission of the virus among those women.
Methods: A total of 105 women were enrolled in this analytical cross-sectional study. The blood samples were collected from all women, and the sera were separated; then the anti-CMV IgG and IgM were determined using commercially available ECLIA techniques. The data was analyzed using SPSS.
Results: The overall seroprevalence of IgG against CMV infections was 104 (99.0%) and 4 (3.8%), respectively. The highest rates of IgG seropositivity among aborted women were 41 (100%) and 25 (100%) in the age groups 26–35 years and >35 years, respectively; 19 (100%) and 41 (100%) among illiterate women and those who had secondary school education, respectively; 25 (100%) among women living in urban areas; 50 (100%) and 3 (100%) among women who had medium and high socioeconomic status, respectively; and 12 (100%) among women who had private work. In contrast, the rates of IgM antibodies were high: 2 (5.1%) among women in the age groups <25 years, 5.3% among illiterate women, 4% among women who were living in urban areas, 5.2% among women with low income, and 4.3% among housewives. The positive anti-HCMV IgG and IgM had no significant association with number, trimester, symptoms, and other related factors.
Conclusion: The seroprevalence of IgG antibodies of CMV infections among aborted women in Abyan. Women living in urban areas had the highest rates of both anti-HCMV IgG and IgM antibodies. Seroprevalence of anti-HCMV IgG and IgM were different according to the sociodemographic status of women. There was no significant association between the seroprevalence of anti-HCMV IgG and IgM and the number and time of abortion, symptoms, and other risk factors.

Keywords: Seroprevalence, cytomegalovirus, aborted women, Abyan, Yemen

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INTRODUCTION

Cytomegalovirus (CMV) is one of the largest members of the herpesvirus family. CMV can cause potentially life-threatening complications in infected pregnant women and fetuses (1). It is the most common cause of congenital abnormalities among fetuses, resulting in disorders that cause the loss of hearing, blindness, and mental retardation (2). Although CMV infections occur worldwide, the majority of infections occur in developing countries (3).

Infections of CMV are based on the immunity of infected individuals, where the immunocompetent individuals exhibit subclinical asymptomatic infections, while severe fatal infections occur among immunocompromised and immunodeficient patients (4,5). One of the unique properties of herpesviruses, including CMV, is a prolonged period of persistence (latency). The virus remains dormant inside the infected host cells for a life without a replicative cycle (6). Reactivation is the process in which the virus is activated and replicated again (7). This occurs commonly in immunocompromised individuals, including acquired immunodeficiency syndrome (AIDS) patients, who are characterized by severe CMV complications (8,9).

The transmission of the virus may occur transplacentally (fetus), perinatally (newborns), which occurs in the birth canal and during breastfeeding (10,11), contact with contaminated saliva, especially by kissing, and also contact with urine (young children) (12). In adults, the virus is commonly transmitted by sexual routes and during repeated blood transfusions and organ transplants, especially kidney and bone marrow transplants (7). In Yemen, the seropositive immunoglobulins (Igs), IgG against CMV, among Yemeni blood donors was 96.6% (13), among pregnant women ranging from 68% to 100% (14), and among aborted women 98.67% and 77.6% (1,15). The data about the seroprevalence of CMV infection among aborted women in Abyan Governorate was not clear. Therefore, the current study aimed to determine the seroprevalence of IgG and IgM against CMV among aborted women in Abyan Governorate, Yemen, and to determine the number and trimesters of abortions as well as other related risk factors that may contribute to transmission of the virus among those women.

METHODS

A total of 105 women who had abortions were accepted to participate in this analytical cross-sectional study. The women were attending maternity units in different medical centers and hospitals in Abyan, Yemen. A predesigned questionnaire with some modifications was used to collect the data. The data includes sociodemographics such as age, education level, residence, income, and occupation. Other data about the number and trimesters of abortion, symptoms, and other related factors such as blood transfusion and use of corticosteroid drugs (1,15).

The blood samples were collected from all women, and the sera were separated after clotting of blood using a centrifuge. The anti-CMV IgG and IgM were determined using the Cobas technique. This technique was commercially available and based on electrochemiluminescence immunoassay (ECLIA).

Statistical Analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS®) software (Version 21). The ages of aborted women were normally distributed, so the mean values and standard deviations (SD) were determined, while most data was qualitative; therefore, the number and percentages of variables were calculated. The chi-square (χ^2) test was used to determine the presence of significant association between different variables. A p-value of <0.05 was considered statistically significant.

Ethics Approval and Consent Form

Ethical approval from the Ethics Committee of the College of Medicine and Health Science at the University of Science and Technology; MEC No. (MEC/AD089). The written consent form was obtained from each woman before performing any procedure.

RESULTS

One hundred and five aborted women were enrolled in current study, the mean± SD of age was 29.31 ±7.43 years. The age range was between 13 years and 45 years (Table 1). The overall seroprevalence of IgG against HCMV infections was 104 (99.0%) and 4(3.8%), respectively (Figure 1). The highest rates of IgG seropositive among aborted women according to

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sociodemographic characteristics were 41 (100%) and 25(100%) in the age groups 26 – 35 years and >35 years, respectively, 19(100%) and 41(100%) among illiterate women and those had secondary school education, respectively, 25(100%) among women living urban areas, 50(100%) and 3(100%) among women who had medium and high socioeconomic status, respectively and 12(100%) among women who had private work. In contrast, the rates of IgM antibodies were high 2(5.1%) among women in the age groups <25 years, 5.3% among illiterate women, 4% among women who were living in urban areas, 5.2% among women with low income and 4.3% among housewives (Figures 2-6).

The highest prevalence of anti-HCMV IgG was 31(100%),18(100%), and 12(100%) among women who aborted two, three, and more times, respectively while the IgM was high at 6.5% among women who aborted two times. The highest seroprevalence of IgG was 76 (100%) and 17(100%) among women who aborted in the first and second trimesters of pregnancy while the IgM was high among women who were exposed to abortion in the second trimester. Both anti-HCMV IgG and IgM antibodies were 61(100%) and 3(4.9%), respectively among women who were exposed to recurrent abortions. Regarding the symptoms and related risk factors, all women who had previously been exposed to blood transfusion used corticosteroid drugs and had a skin rash and lymphadenopathy symptoms were positive for IgG antibodies against HCMV while IgM were 2.6%, 4.5%, 0%, and 10% among women who exposed to blood transfusion, used corticosteroid drug and had skin rash and lymphadenopathy, respectively (Table 2). The positive anti-HCMV IgG and IgM had no significant association of time, number, trimester, and other related factors.

Table 1: The sociodemographic characteristics of 105 aborted women in Abyan-Yemen.

Variable	Number	Parentage %	Variable	Number	Parentage %
Age (years)			**Socioeconomic status**		
≤25	39	37.1	Low	47	44.8
26-35	41	39.0	Medium	55	52.4
>35	25	23.8	High	3	2.9
Education level			**Occupation**		
Illustrate	19	18.1	Housewife	93	88.6
Primary school	45	42.9	Private work	12	11.4
Secondary school	41	39.0			
Residence					
Rural	80	76.2			
Urban	25	23.8			

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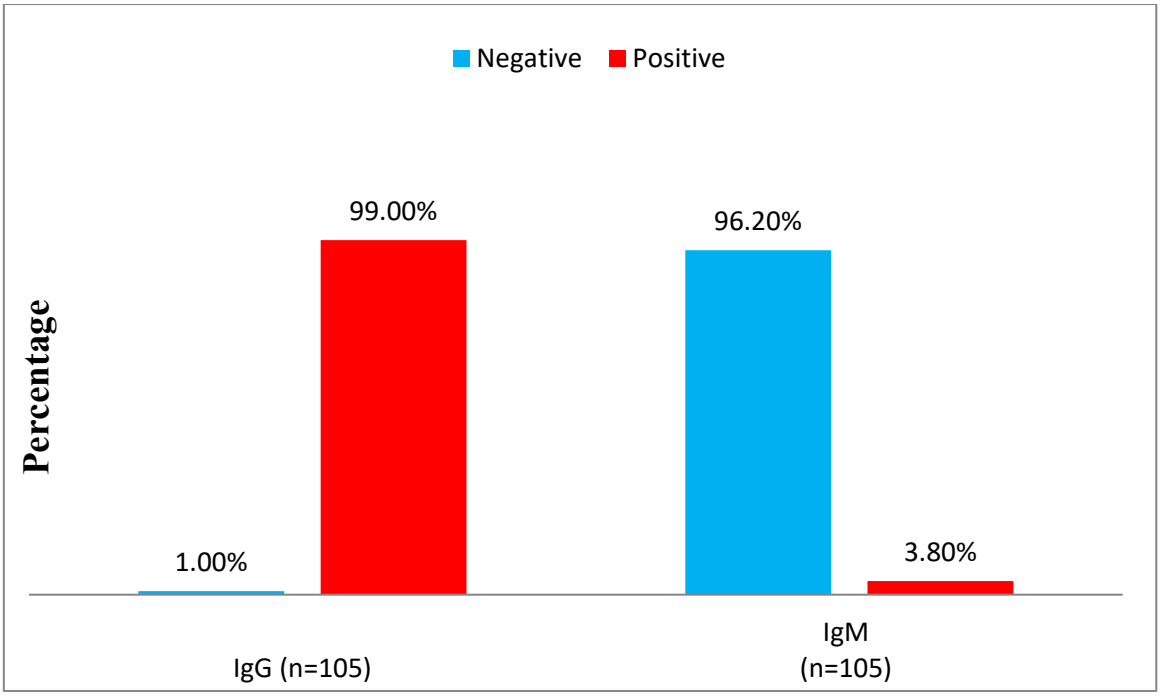

Figure 1: Seroprevalence of HCMV IgG and IgM antibodies among aborted women in Abyan –Yemen

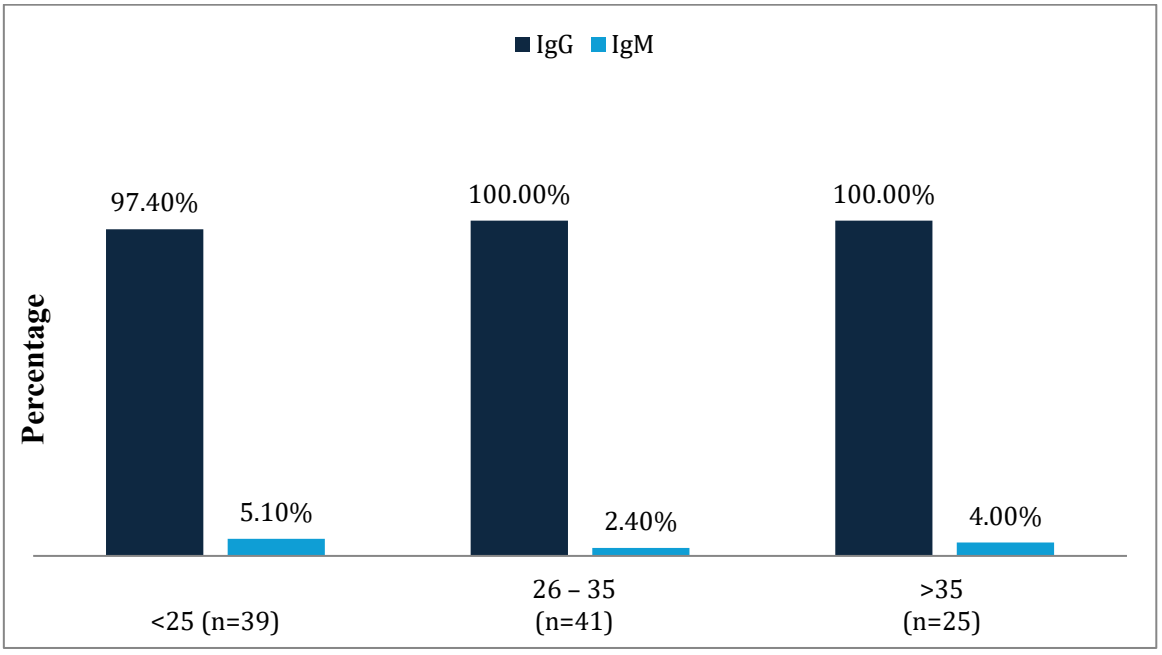

Figure 2: The seroprevalence of anti-HCMV IgG and IgM among aborted women related to their age groups in Abyan, Yemen.

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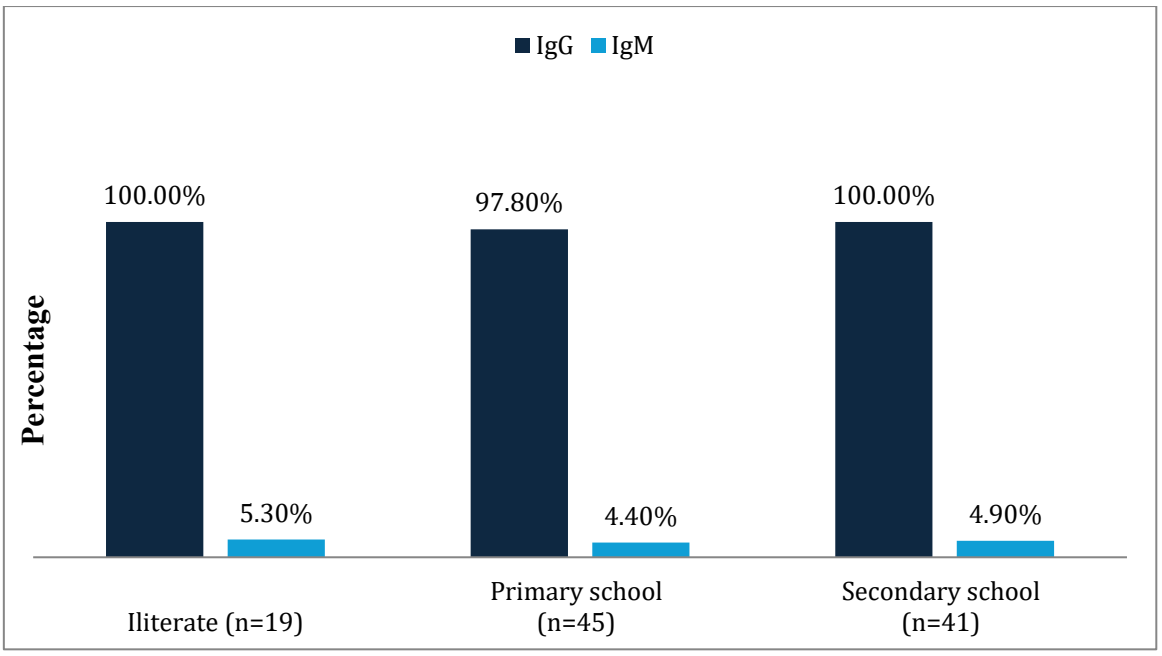

Figure 3: The seroprevalence of anti-HCMV IgG and anti-HCMV IgM among aborted women according to their educational levels in Abyan, Yemen.

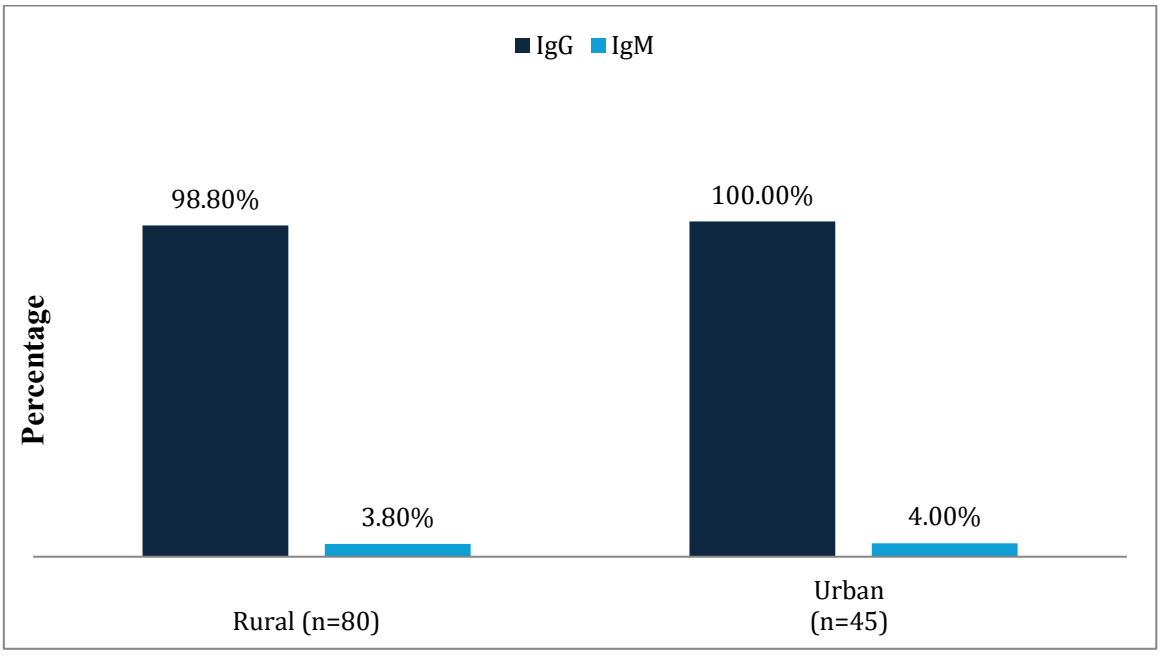

Figure 4: The seroprevalence of anti-HCMV IgG and anti-HCMV IgM among aborted women according to their residence in Abyan, Yemen.

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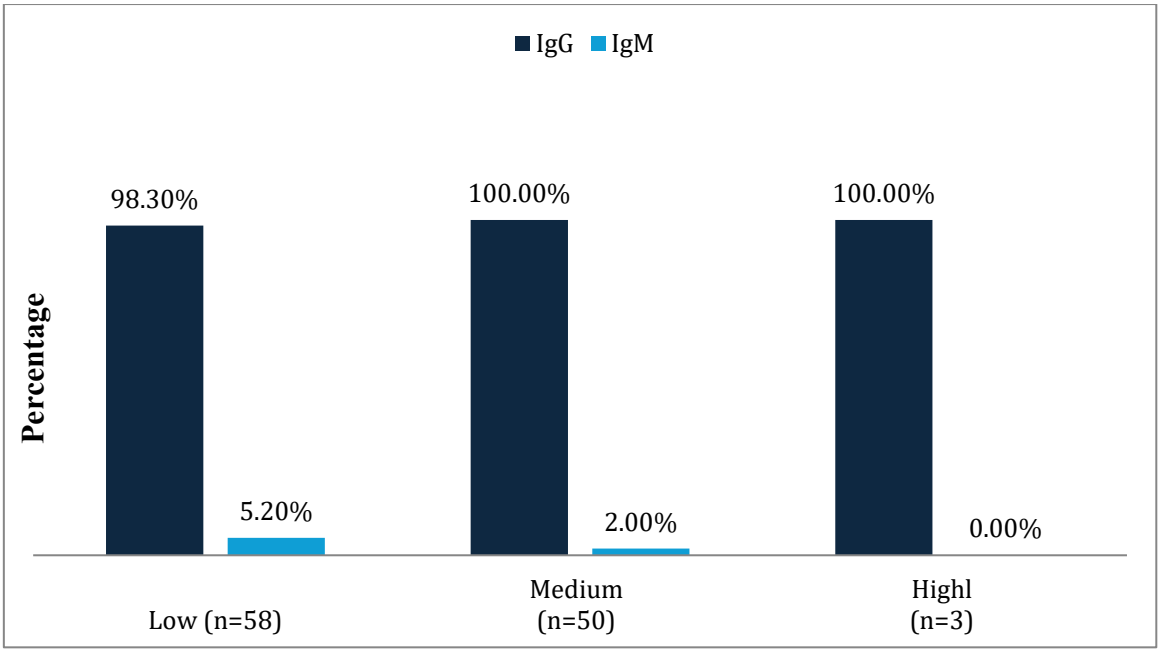

Figure 5: The seroprevalence of anti-HCMV IgG and anti-HCMV IgM among aborted women according to their socioeconomic status in Abyan, Yemen.

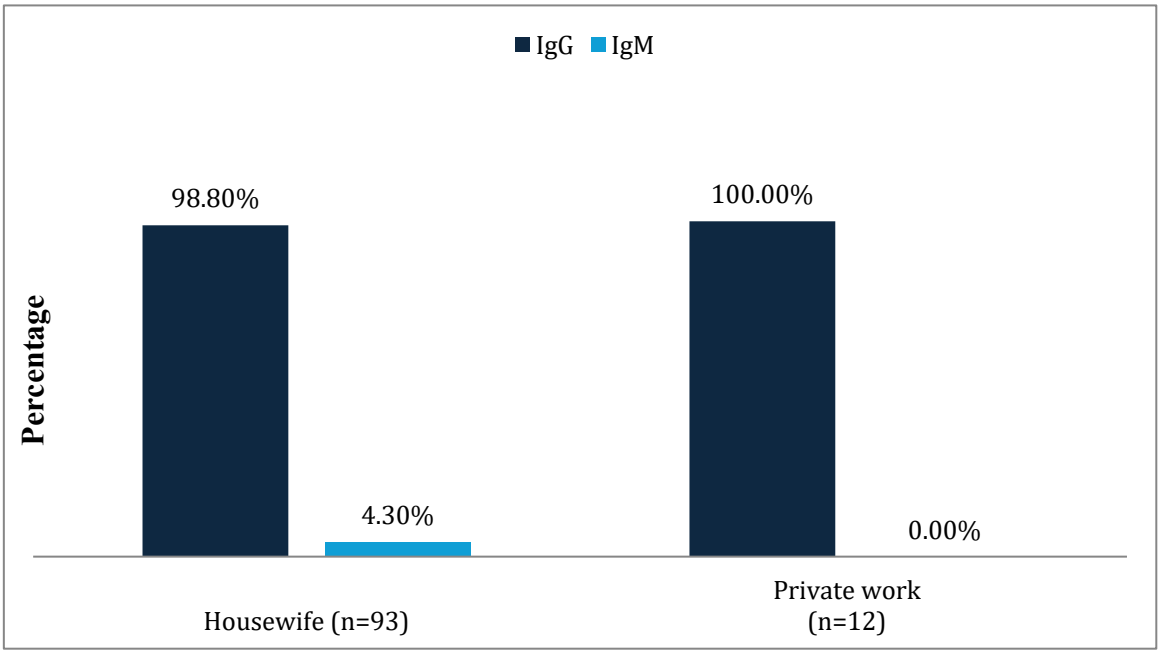

Figure 6: The seroprevalence of anti-HCMV IgG and anti-HCMV IgM among aborted women according to their occupation in Abyan, Yemen.

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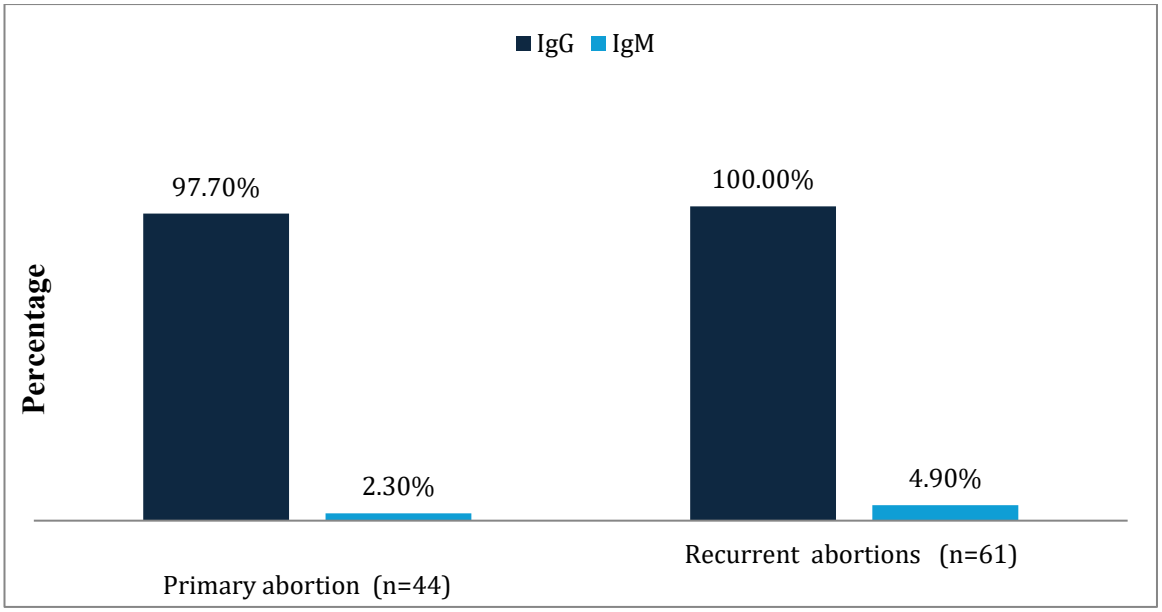

Figure 7: The seroprevalence of anti-HCMV IgG and IgM among primary and recurrent aborted women in Abyan, Yemen.

Table 2: The seroprevalence of anti-HCMV IgG and IgM among aborted women according to number and time of abortion, symptoms, and other related factors in Abyan, Yemen.

Category	IgG positive		P-value	IgM positive		P-value
	No.	%		No.	%	
Number Abortion						
Twice (n=31)	31	100.0	0.705	2	6.5	0.339
Third (n=18)	18	100.0	0.829	1	5.6	0.534
More than 3 (n=12)	12	100.0	0.868	0	0.0	---
Trimesters						
1st trimester (n=76)	76	100.0	0.276	2	2.6	0.305
2nd trimester (n=17)	17	100.0	0.838	2	11.8	0.122
3rd trimester (n=12)	11	91.7	0.114	0	0.0	--
Symptoms						
Skin rash (n=17)	17	100.0	0.565	0	0.0	___
Lymphadenopathy (n=10)	10	100.0		1	10.0	0.358
Risk factors						
Blood transfusion (n=38)	38	100.0	0.638	1	2.6	0.541
Use corticosteroid (n=44)	44	100.0	0.581	2	4.5	0.560

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DISCUSSION

The most fatal complications of CMV infection occur among women and their fetuses (1). In the current study, the seroprevalence of anti-HCMV IgG among aborted women was 104 (99%). A slightly similar result was 98.7%, found in Yemen (15). Two studies from Sudan and Iraq reported that 97.8% and 96% of aborted women had IgG seropositive, respectively (16,17). Our result was higher than different studies conducted globally, such as 92.50% in India (18), 88.9% in Sudan (19), 89% and 85% in Iraq (20,21), and 77.6% in Yemen (1). Elbushra et al. noticed that the seroprevalence of IgG was 74.8% (22). Our IgG seroprevalence was one of the highest rates among aborted women. It also was higher than that reported among the general Yemeni population, which was 96.6%, and among blood donors, 68% (13).

The seropositive rate of IgM among aborted women in this study was 4 (3.8%). A report from Sudan demonstrated that 2.2% of women who were exposed to abortion had seropositive IgM antibodies against CMV infection (16). Abbas et al. showed that 7% of aborted women were positive for anti-HCMV IgM (15). The zero percent was reported in Sudan (19). Different studies also noticed higher rates than ours, such as 7%, 10%, 13.3%, and 15.7% from Iraq and Sudan (17,20,22,23) and 20% from India (18). A study from Yemen revealed that the prevalence of anti-HCMV IgM was 83.3% (1). One of the higher results was recorded among Iraqi women who had abortions, which was 93% (21). Alghalibi et al. found that the anti-HCMV IgM among pregnant women was 1.8% (14). The variations in results may be attributed to poor socioeconomic status and poor hygiene practices and the increased HCMV prevalence in developing countries compared to developed ones (15), as well as the sensitivity of diagnostic techniques used to test the HCMV infection (24).

In the current data, the aborted women with the age groups 26–35 years and >35 years had the highest rates of anti-HCMV IgG antibodies, which were 41 (100%) and 25 (100%), respectively. Research from Iraq and Libya revealed that aborted women in the age groups 21–30 years had the highest rate of IgG antibodies (25,26). Gubran reported that 81% of women who had abortions in the age groups 30-34 years had positive anti-HCMV IgG antibodies (1). Hussein et al. showed the highest anti-HCMV IgG rate among women in the age groups 36-40 years (20). A study undertaken in Yemen reported that aborted women in the age group 26-50 years had the highest rates (15). Regarding anti-HCMV IgM antibodies in our study, the prevalence was high (2 [5.1%]) among women in the age groups < 25 years. A similar result was recorded in Yemen (15). Different studies revealed different rates among different age groups, Mohammed, such as the 19-45-year-old, 20-29-year-old, and 21-30-year-old age groups in Iraq and Libya (20, 25, 26, 27) and the 25-29-year-old age group in Yemen (1). Older women interact and come into contact with more risk factors (28). The breastfeeding transmission, latency properties of the virus, and wide practice of breastfeeding females during infancy may contribute to the seroprevalence of CMV among young females (29).

According to the level of education, this result observed a high percentage of 19 (100%) and 41 (100%) of IgG antibodies among those who were illiterate and those who had secondary school education, respectively. Gubran showed that illiterate women had the highest IgG rate (1). Abbas et al. found that illiterate women and those women who had university education levels had the highest rate (15). In contrast, illiterate women had the highest 5.3% IgM rate in this study. This was in agreement with two studies from Yemen (1,15). There are several factors contributing to increasing HCMV infection among the studied population, such as poorer socioeconomic status, education, and hygienic practices (29,30,31).

The results in this study demonstrated that women living in urban areas had the highest rates of both anti-HCMV IgG and IgM antibodies (100% and 4%), respectively, compared to those living in rural areas. Abbas et al. revealed the opposite finding (15).

The current data revealed that the women who had medium and high socioeconomic status had the highest rates of anti-HCMV IgG antibodies, 50 (100%) and 3 (100%), respectively. Abbas et al. noticed that the highest IgG antibodies were among women who had low and medium socioeconomic status (15). In contrast, those women with low socioeconomic status had high anti-HCMV IgM antibodies (5.2%). A similar result was reported in Yemen (15).

As regards the occupation of aborted women, those women who had private work had the highest rate of 12 (100%) of anti-HCMV IgG, while the housewives had the highest anti-HCMV IgM rate of 4.3%. No

literature agreed or disagreed with our finding, so this was considered the first finding.

The number of abortions: those women who aborted two times or more had the highest rate of anti-HCMV IgG. Gibran revealed that women who aborted three times had high anti-HCMV IgG antibodies (1). Ibrahim et al. recorded that women who aborted for the first time had the highest IgG rate (19). Regarding anti-HCMV IgM, the women who aborted two times had the highest rate, 6.5%. This result was in agreement with that recorded in Sudan (19). Gubran found different results (1).

Related to the trimester of abortion, the women who aborted in the first and second trimesters had the highest IgG antibodies. A report from Yemen demonstrated that women who aborted in the second and third trimesters had the highest IgG rate (15). Ibrahim et al. noticed that women who aborted in the second trimester had the highest IgG rate (19). Another study was also done among Yemeni women who aborted, revealing the highest IgG antibodies among women who aborted in the first trimester (1). In the current study, the prevalence of anti-HCMV IgM was high among those women who aborted in the second trimester. Abbas et al. identified that those women who aborted in the third trimester had the highest anti-HCMV IgM rate (15), while a report from Sudan showed the highest rate among those who aborted in the first trimester (19). The differences could be the genetic and immunological status of women and their fetuses as well as the time of infections of the mother and fetus (32).

According to the symptoms and risk factors in the present data, all aborted women (100%) who had skin rash and lymphadenopathy symptoms had IgG antibodies, whereas no positive cases and 10% of them had IgM antibodies, respectively. Abbas et al. found that 40% and 21.33% of aborted women who had skin rash and lymphadenopathy symptoms were positive for CMV IgG antibodies, and 5% and 6.5% had IgM antibodies, respectively (14). All women who were exposed to blood transfusion 100% also had IgG antibodies against HCMV. Gubran showed that IgG antibodies are found in 75% of women exposed to blood transfusion (1). The present study identified that all women who used corticosteroid drugs had 100% IgG antibodies against HCMV infection. Gubran reported that IgG antibodies are found in 75% of women who used corticosteroid drugs (1). The small size of the studied group and the lack of molecular techniques, which are more accurate, such as polymerase chain reaction (PCR), are considered two of the important limitations of this study.

CONCLUSION

The seroprevalence of IgG antibodies of CMV infections among aborted women in Abyan, Yemen, was higher than those reported globally, whereas the seroprevalence of IgM antibodies was lower than most previous studies. Women living in urban areas had the highest rates of both anti-HCMV IgG and IgM antibodies. Seroprevalence of anti-HCMV IgG and IgM were different according to the sociodemographic status of women. There was no significant association between the seroprevalence of anti-HCMV IgG and IgM and the number and time of abortion, symptoms, and other risk factors.

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Conflict of Interest

The authors declare that no conflict of interest.

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