

Research Article

# Association of IgG and IgM Levels of CMV Infection with Abortion among Women who Smoke

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## A B S T R A C T

**Introduction:** Human Cytomegalovirus (CMV) infection has become common worldwide. The current study was suggested to evaluate the impact of smoking on abortion in Human Cytomegalovirus (CMV) infected women.

**Method:** The study was conducted on 66 women IgG and IgM were used to detect CMV infection in women who had undergone abortion.

**Results:** The current results showed significant differences in the number of births and marriage duration ( $p=0.009$ ,  $p=0.010$ ) and non-significant difference in age ( $p=0.750$ ) in both groups. There was a high percentage of smokers (21.21%) in women with abortion as compared to the healthy group. There were significant elevations of IgG ( $2.32 \pm 0.53$ ) and IgM ( $0.51 \pm 0.312$ ) levels in women who had undergone abortion ( $p = 0.000$ ) as compared to healthy women. A significant inverse association between IgG level and number of abortions ( $p=0.019$ ), and a non-significant weak correlation between IgM and number of abortions ( $p=0.969$ ) was noted. The impact of smoking on the number of abortions and birth showed non-significant differences ( $p=0.871$ ,  $p=0.955$ ) respectively between smoker and non-smoker groups. Healthy women didn't have any abortion and showed non-significant differences in the number of births ( $p=0.430$ ) in comparison with abortion group. The effect of smoking on the levels of IgG and IgM of study groups shows non-significant changes.

**Conclusion:** The current study concluded that smoking does not contribute to abortion in any direct effect, but it may lead to CMV infection by weakening the immune response.

**Keywords:** Association, CMV Infection, Abortion, Smoking, Women

## Introduction

Human Cytomegalovirus (CMV) infection has become common worldwide with a seropositivity rate of 40-100% in developing countries. CMV is a member of the herpesviridae family and causes several health problems.<sup>1,2</sup> Different clinical manifestations with a rare symptomatic disease can be seen in immunocompetent hosts. Some scenarios have been observed in critically ill and immunocompromised hosts<sup>3,8</sup> more infections were studied in pregnant women in the last few decades. An infection during pregnancy can lead to congenital CMV, and several complications in the child like hearing loss, impairment in vision, and mental retardation of varying degrees.<sup>9,13</sup>

The primary infection of CMV causes loss in pregnancy. Though the mechanism of the role of CMV infection in abortion is still under investigation, some explanations have been documented.<sup>14,20</sup> A study has found a higher CMV antigen in the abortion tissue and higher seropositivity.<sup>21</sup> Controversial findings have been seen in prospective studies. Some of them found a higher risk of pregnancy loss while others didn't prove it.<sup>22,23</sup> CMV infection was also seen in cases of recurrent abortion. Some other studies observed a higher prevalence and higher antibody titers to CMV in recurrent abortion cases, while others found less prevalence of CMV antibodies in aborted women than in healthy women.<sup>24,28</sup>

Smoking among pregnant women causes some harmful problems like low birth weight, abruption in placenta, and sudden infant death syndrome.<sup>29,30</sup> Some investigations have proven the association between smoking and miscarriages but others suggested that there was not sufficient evidence to prove it.<sup>30,32</sup> The association between CMV infection and smoking in abortion has been analysed in the current study.

## Methodology

This is a case-control study that included 66 women who attended Al Elwea Maternity Hospital in Baghdad and suffered from spontaneous abortion in different pregnancy periods during three months (January-March) in 2021. They were diagnosed by Obstetrics and Gynecology specialists.

Data (age, number of healthy birth and abortion, smoking habits, and marriage duration) and blood samples were collected from each patient with written consensus was obtained. Ethical approval was obtained from the Ministry of Health and Environment in Iraq and informed consent was taken from all participants. Blood samples were then transferred to serum isolation for detecting CMV IgM, and IgG by ELIZA tool (Biokit, Spain). Samples were classified into patients and control groups, and sub-groups included smokers and non-smokers. Data were reported as mean  $\pm$  SD and percentages. Statistical analysis was implemented using independent sample t test, and correlation coefficient at p-value less than 0.05.

## Results

The current findings included CMV IgG and IgM values and their association with the number of abortions in women who smoke. The results of the study showed that there were significant differences in the number of births and marriage duration ( $p=0.009$ ,  $p=0.010$ ) of participants of patients and control group, and non-significant difference in age between both groups ( $p=0.750$ ). There was a high percentage of smokers (21.21%) among women with abortions than in the healthy group (6.66%). There was no woman with an abortion in the healthy group (Table 1).

There were significant elevations of IgG ( $2.32 \pm 0.53$ ) and IgM ( $0.51 \pm 0.312$ ) levels in women who had undergone abortion ( $p=0.000$ ) as compared to healthy women (Table 2).

There was a significant inverse association between IgG level and the number of abortions ( $r=-0.289$ ,  $p=0.019$ ), and a non-significant association between IgM and the number of abortions ( $r=0.005$ ,  $p=0.969$ ) (Figure 1).

The impact of smoking on the number of births and abortions showed non-significant differences ( $p=0.955$ ,  $p=0.871$ ) respectively between smoker and non-smoker groups. Healthy women didn't have any abortion and hence showed non-significant differences in the number of births ( $p=0.430$ ) (Table 3).

**Table 1. Sociodemographic Data of Participants**

Study Groups	Age (year)	Number of Abortions	Number of Births	Marriage Duration (year)	Smokers (%)
Women who had undergone abortion	30.61 $\pm$ 6.98	3.86 $\pm$ 1.76	1.52 $\pm$ 1.67	8.18 $\pm$ 4.8	21.21
Healthy women	30.13 $\pm$ 6.46	0	5.60 $\pm$ 3.30	5.6 $\pm$ 3.3	6.66
P	0.750	-	0.009	0.010	-

Independent sample t-test at p-value less than 0.05

Table 2. IgG and IgM Levels in Study Groups

Study Groups	CMV IgG	CMV IgM
Women who had undergone abortion	2.32±0.53	0.51±0.312
Healthy women	1.69±0.56	0.20±0.08
P-value	0.000	0.000

Independent sample t-test at p-value less than 0.05

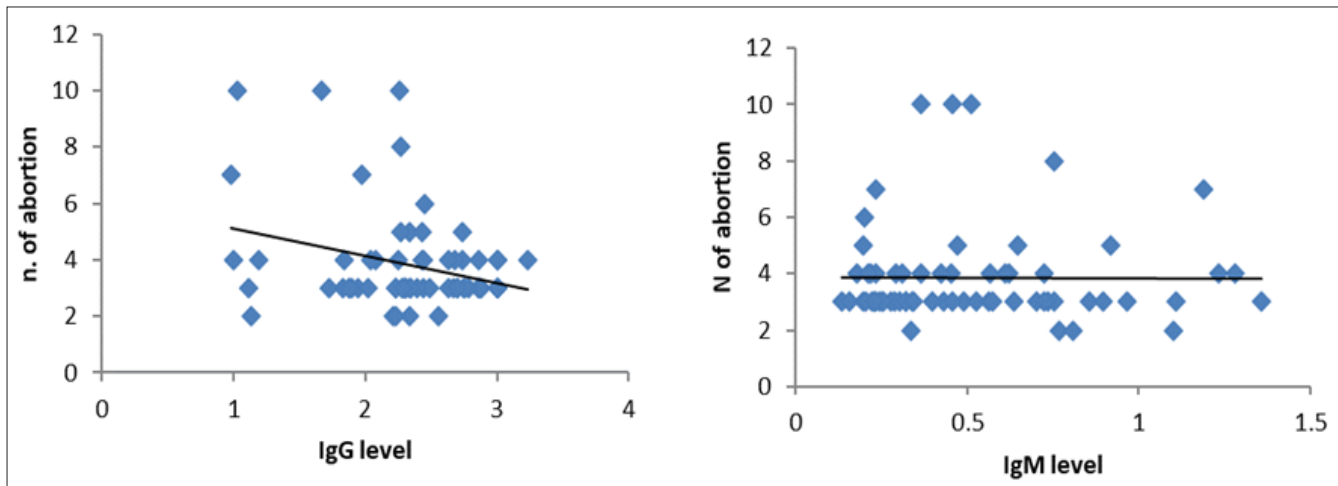


Figure 1. Correlation between Number of Abortions and IgG and IgM Levels in Women who had Undergone Abortion

Table 3. Impact of Smoking on the Number of Abortions and Births in Study Groups

Study Groups	Smoker		Non-Smoker		P1 value	P2 value
	Number of Births	Number of Abortions	Number of Births	Number of Abortions		
Women who had undergone abortion	3.85±1.87	1.64±2.09	1.55±1.62	3.82±1.75	0.955	0.871
Healthy women	1.50±0.70	0	2.51±1.76	0	0.430	-

P1: Significance between number of births in smoker and non-smoker women who had undergone abortion, and smoker and non-smoker healthy women.

P2: Significance between number of abortions in smoker and non-smoker women who had undergone abortion.

Independent sample t-test.

The effect of smoking had a slightly non-significant association with the levels of IgG and IgM of participants of both groups (Table 4).

Table 4. Effect of Smoking on the Levels of IgG and IgM in Study Groups

Study Groups	Smoker		Non-Smoker		P1 value	P2 value
	CMV IgG	CMV IgM	CMV IgG	CMV IgM		
Women who had undergone abortion	2.40±0.55	0.62±0.39	2.29±0.53	0.48±0.28	0.522	0.133
Healthy women	1.68±1.10	0.15±0.04	1.69±0.54	0.21±0.08	0.978	0.370

P1: significance between IgG of smoker and non-smoker women who had undergone abortion, and smoker and non-smoker healthy women.

P2: significance between IgM of smoker and non-smoker

women who had undergone abortion, and smoker and non-smoker healthy women.

Independent sample t-test.

## Discussion

Smoking is associated with several infectious diseases leading to prevalence and mortality elevation. Various pieces of evidence have proved that smoking is suspected to impact the outcome of pregnancy in different scenarios like spontaneous abortion. Therefore, taking this into consideration, it is important to detect the correlation between spontaneous abortion and smoking.<sup>33</sup>

CMV is a global highly prevalent herpes virus. In a study done in Kirkuk city, it was found that the prevalence rate of CMV IgG seropositivity was 37%, while CMV IgM seropositivity was lower than 1% in the middle-age group (26-36 years old) women.<sup>34</sup> Some reports found an association between spontaneous abortion and smoking. However, it is still under investigation.<sup>35,37</sup>

The present findings showed a significant association of abortion with a CMV infection and an inverse correlation of IgG with the number of abortions. A similar study found a significant association of abortion history, place of residence, and personal hygiene status with IgG seropositivity.<sup>38</sup> Another study suggested that the intrauterine infection risk depended on the infection time through pregnancy that may increase in the third trimester.<sup>39</sup> It could result in miscarriage and stillbirth.<sup>40</sup> Therefore, the CMV test must be applied at each stage of pregnancy to avoid complications. The lack of health awareness of pregnant women in Iraq may cause recurrent abortions.

The impact of smoking wasn't observed in the number of abortions, number of births and in IgG and IgM levels in women who had undergone abortion. About 21% of the current study group were smokers and suffered from spontaneous abortion. An early study by Munk et al.<sup>40</sup> didn't observe any effect of smoking habits in pregnant women in the first and the second test. Other results of this study didn't agree with the present findings. Nielsen et al.<sup>32</sup> found that pre-pregnancy smoking is correlated with spontaneous abortion, and the risk of abortion increased with the number of cigarettes per day.

The impact of smoking on pregnancy may be because of the accumulation of heavy metals like cadmium that lead to abortion.<sup>41</sup> On the other hand, the effect of smoking on the immune response has been well established. There is evidence that long-period and high-dose exposure to cigarette smoking can destroy the immune system and cause a lack of inflammatory response control in addition to cell dysfunction and limitation of effector molecules.<sup>42,44</sup> and this may be contributed to virus infection and development. However, other factors must be detected like period of smoking, number of cigarettes and passive smoking habit, in addition to genetic damage, and chromosome instability in fertilising egg or in sperm which can lead to abortion.<sup>45,46</sup>

The current findings need further investigations about other factors that may be implicated in abortion.

## Conclusion

The current study concluded that smoking is not a contributing factor to abortion in terms of any direct effect, but it may lead to CMV infection by weakening the immune response.

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**Conflict of Interest:** None

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