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Original Research Article

Seroprevalence and Clinical Correlates of Cytomegalovirus and Herpes Simplex Virus-2 Infections in Pregnant Women

Ashwini Sagar K.V.[1], Sharada[2], Lyra P.R.[3]

[1]Assistant Professor, Department of Microbiology, BGS Medical College & Hospital, Nagarur, Bangalore
[2]Assistant Professor, Department of Microbiology, Yadgiri Institute of Medical Sciences, Yadgiri
[3]Associate Professor, Department of Microbiology, BGS Medical College & Hospital, Nagarur, Bangalore

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Corresponding Author: Dr. Ashwini Sagar K.V.
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Abstract:

Introduction: TORCH infections are major causes of congenital anomalies. Among them, cytomegalovirus (CMV) is the most frequent perinatal viral infection and the leading cause of congenital CMV disease, with seroprevalence ranging widely from 30.4% in Ireland to 98.9% in Turkey. Herpes simplex virus type-2 (HSV-2), a common sexually transmitted infection, can be transmitted in utero, during delivery, or postnatally, resulting in congenital or neonatal disease. These infections are often asymptomatic, making clinical diagnosis difficult. Serological testing, particularly ELISA, offers a sensitive and specific method for detection. This study aimed to determine the seroprevalence of CMV and HSV-2 among pregnant women.

Methods: A cross-sectional study was conducted on 100 pregnant women attending the antenatal clinic of a tertiary care hospital. Five milliliters of venous blood were collected, and sera were analyzed for anti-CMV and anti-HSV-2 IgM and IgG antibodies using ELISA.

Results: Most participants were between 21 and 25 years of age, from rural areas (76%), in the third trimester (84%), nulliparous (69%), and from lower socioeconomic status (59%). None of the women tested positive for anti-CMV or anti-HSV-2 IgM antibodies. The seroprevalence of anti-CMV IgG was 67%, while anti-HSV-2 IgG was 47%.

Conclusion: A substantial proportion of pregnant women showed prior exposure to CMV and HSV-2, although no active infections were detected. Greater awareness of these infections and their adverse outcomes is needed. Routine antenatal screening and preventive education should be emphasized to reduce maternal and neonatal morbidity and mortality.

Keywords: Cytomegalovirus, Herpes simplex virus-2, Pregnant women, Congenital anomalies, ELISA.

Introduction

Pregnancy induces a transient immunosuppression, which will increase the vulnerability of pregnant women to various viral infections.[1] Infections in pregnancy may cause significant morbidity and mortality through different mechanisms, and they also cause substantial fetal and neonatal mortality. [2,3]

Congenital infections are infections that are transmitted vertically to the foetus. These infections may lead to various forms of malformations, neurodevelopmental delay, and long- term childhood consequences (such infections include syphilis, varicella, rubella, cytomegalovirus, toxoplasmosis, parvovirus B19, and human immunodeficiency virus). Other maternal infections may adversely affect the course of the pregnancy, leading to increased risks for miscarriage or preterm delivery (such infections include listeriosis, asymptomatic bacteriuria, vaginal bacterosis). Some infections are associated with possible severe neonatal sepsis (examples include Group B streptococcus infection or colonisation, and genital herpes).[3]

Some congenitally acquired infections are caused by a group of microorganisms called the TORCH complex, which includes Toxoplasma gondii as well as other microorganisms such as Treponema pallidum, the Rubella virus (RV), Cytomegalovirus (CMV) and the Herpes Simplex Virus (HSV) Type I and Type II. These are the groups of infections that cause the main threats of serious congenital infection during pregnancy, which may ultimately cause fetal damage or other anomalies. The gestational age at which the fetus is infected is going to influence the degree of severity. Primary infection can cause more damage than the secondary or reactivated infection.[4]

The inadvertent outcomes produced by these pathogens are abortions, infertility, intrauterine fetal deaths, stillbirths, congenital malformations and reproductive failures.[4]

The prevalence of TORCH infections varies from one geographical area to another. However, countries of Southeast Asia and Sub-Saharan Africa are reported to have the highest figures of stillbirths.[1]

Cytomegalovirus (CMV) and Herpes simplex virus (HSV) belong to the Herpesviridae family, and these are among the most ubiquitous viruses affecting the adult population. A characteristic of this family is lifetime latency after primary infection, and reactivation of the latent virus can recur in infected individuals at any time.[5]

CMV is the most common cause of congenital malformation resulting from intrauterine infection in developing countries. The damage is more severe if infections occur during the first half of the pregnancy, when compared to infections occurring in the second half. Cytomegalovirus infection during pregnancy is more complex than other infections, due to virus reactivation during the childbearing age, and it will be transmitted to the fetus in spite of maternal immunity.[5]

On the other hand, HSV infection of the newborn can be acquired in utero, intrapartum and postnatally. The mother is the usual source of transmission of HSV to the fetus or newborn.

Primary HSV infection during the first half of pregnancy is associated with increased frequency of spontaneous abortion, stillbirth, and congenital malformation. Neonatal herpes is much more frequent (50%) in babies from mothers with a primary HSV infection, when compared to babies from mothers with recurrent HSV infection (<3%).[5]

Since such maternal infections are primarily asymptomatic and the clinical diagnoses in this regard are inconsistent, it is paramount to identify susceptible women, especially those with acute maternal infections, as well as to recognise the predominant and recurrent infections.[3]

Knowledge about the timing of infection in pregnancy will influence decisions about screening and treatment and will also be important for the development of appropriate interventions to reduce infection from mother to baby. The current study aims to identify pregnant women with infection and hence to reduce the incidence of congenital anomalies, abortion, IUGR and neonatal herpes cases and infant mortality.

Materials and Methods

This study was conducted in the Department of Microbiology, Mysore Medical College and Research Institute, on 100 pregnant women attending Cheluvamba Hospital for antenatal care or delivery. Non-pregnant women were excluded. Written informed consent was obtained from all participants, and relevant clinical data were recorded in a structured proforma.

A 5 ml venous blood sample was collected aseptically in a plain vacutainer. Serum was separated by centrifugation at 1000 rpm for 10 minutes and stored at –20°C until testing. All samples were screened for Cytomegalovirus (CMV) IgM/IgG and Herpes Simplex Virus-2 (HSV-2) IgM/IgG antibodies using commercial ELISA kits (Calbiotech, USA) following the manufacturer's instructions.

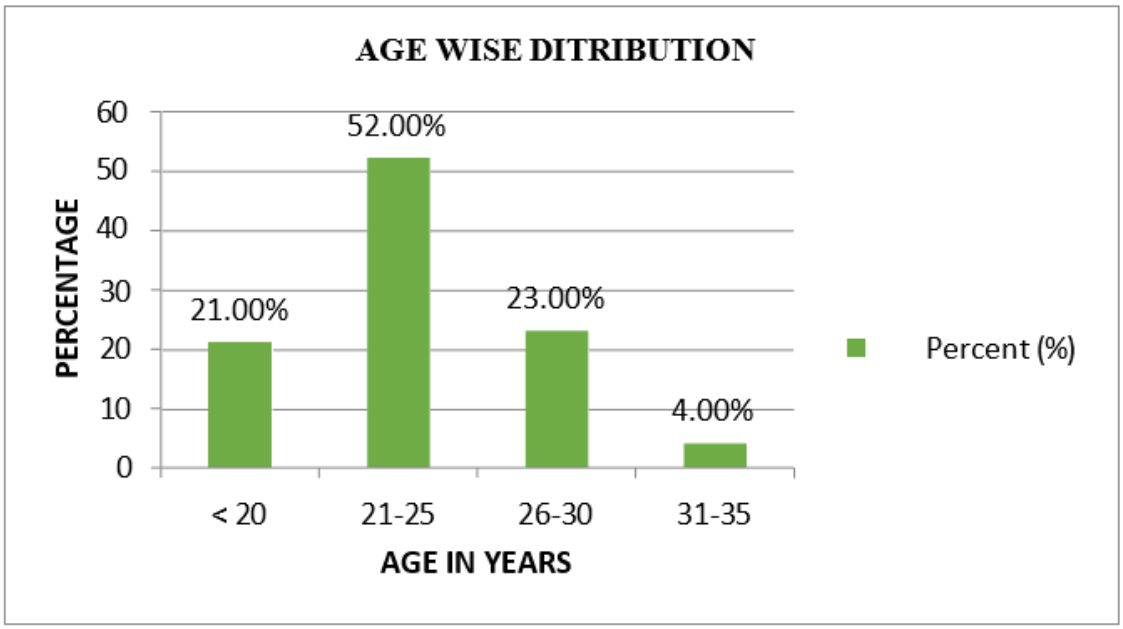
In brief, diluted serum, calibrators, and controls were added to antigen-coated wells, incubated, and washed. Enzyme conjugate and substrate were added sequentially, and absorbance was read at 450 nm using an ELISA reader. Antibody index values were calculated by dividing sample OD by the cut-off OD. Results were interpreted as: positive (>1.1), negative (<0.9), or borderline (0.9–1.1).

The sample size was estimated at 100 using the formula $S=Z^2pq/d^2$, assuming a prevalence of 7%, 95% confidence level (Z=1.96), and 5% precision.

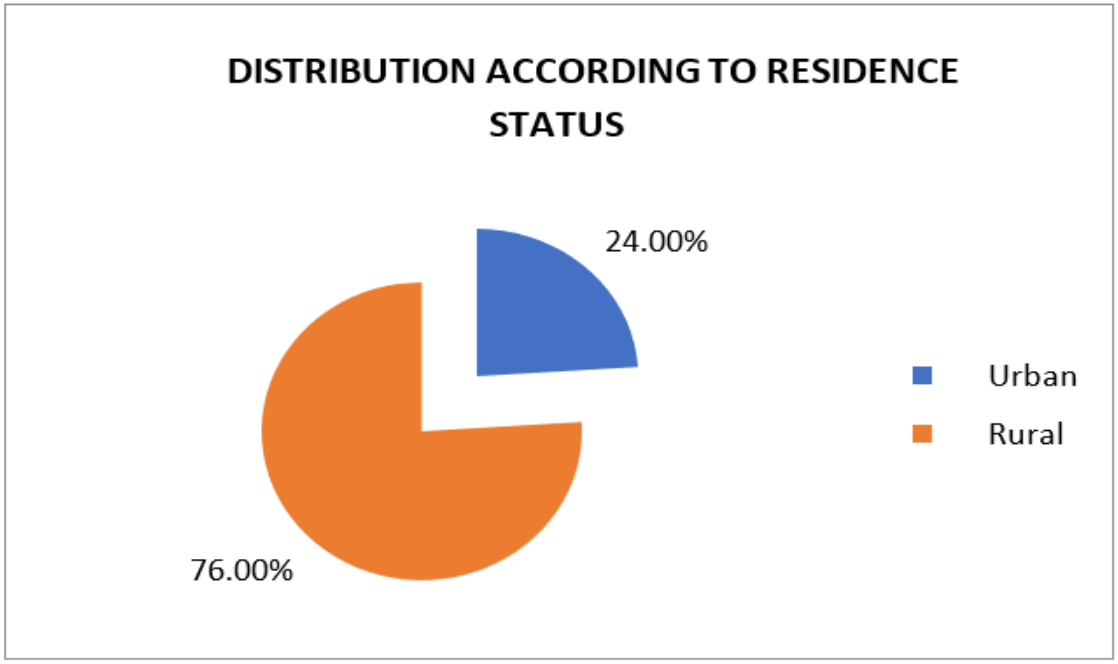
Results

The present study was carried out on 100 pregnant women who attended the Antenatal clinic of Cheluvamba Hospital, Mysore Medical College. All pregnant women enrolled in this study were investigated for the presence of anti-CMV IgM and IgG antibodies and anti- HSV-2 IgM and IgG antibodies in their serum by ELISA. The results are as follows:

The age group of the patient ranged from 18 to 35 years. In this study, the maximum number of Pregnant women was seen in the age group of 21-25 (52%), followed by the 26-35 age group (23%), and the least were from the age group of 31-35 (4%). The Mean age of both groups was 23.51 years, and the standard deviation was 3.43 years (Graph 1).



Graph 1: Distribution of Pregnant women according to age group.



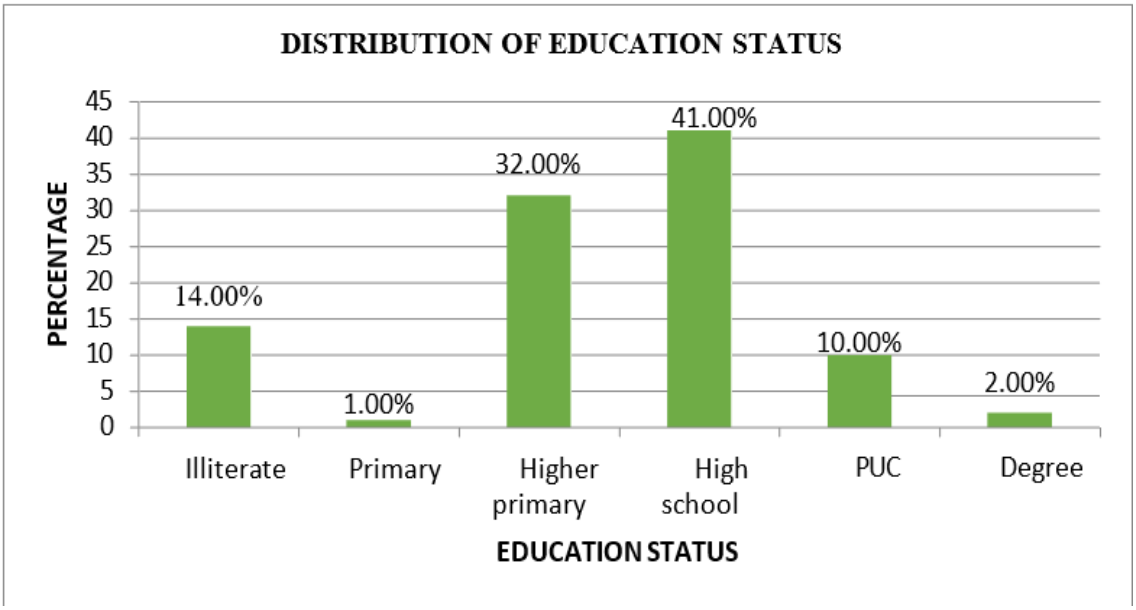
Graph 2: Distribution of pregnant women according to Residence Status.

Out of 100 pregnant women studied, 24 (24.00%) were from urban areas and the remaining 76 (76.00%) resided in rural areas (Graph 2).

Table 1: Distribution of pregnant women according to Education Status

Education	Number	Per cent (%)
Illiterate	14	14.00
Primary	1	1.00
Higher primary	32	32.00
High school	41	41.00
PUC	10	10.00
Degree	2	2.00
Total	100	100.00

Among the 100 pregnant women studied majority of them belong to High school level 41 (41.00%) followed by Higher primary level 32 (32.00%), 14 (14.00%) of the women were illiterate, 10 (10.00%) had studied II PUC, 2 (2.00%) of them were Degree holders and 1 (1.00%) woman belong to Primary level (Table 1).



Graph 3: Distribution of pregnant women according to Education status.

In this study, major number of pregnant women were belonging to lower socioeconomic status i.e. 59 (59.00%) women, 16 (16.00%) women were from lower middle class, 10 (10.00%) women belonged to middle class, 10 (10.00%) women were from upper middle class, and 5 (5.00%) women were from upper class.

In the current study, the majority of pregnant women were in the third trimester (84.00%), followed by those in the second trimester (10.00%) and the first trimester (6.00%). Most participants were nulliparous (69.00%), with primiparous women comprising 29.00%, and only a small proportion being multiparous (2.00%).

In our study, 89 (89.00%) of pregnant women had no history of abortion, while 4 (4.00%) had a history of one abortion, 1 (1.00%) had two abortions, and 4 (4.00%) had three abortions. Additionally, 1 (1.00%) case had a history of intrauterine death, and another 1 (1.00%) had a history of two abortions along with one intrauterine death.

Table 2: Seroprevalence of CMV- IgM and IgG antibodies among pregnant women distribution according to immune response:

Immune response		Number	%	Interpretation
IgM	IgG			
-	+	67	67.0	Previous Exposure
+	+	0	0	Primary Infection
-	-	33	33.0	Susceptible
+	-	0	0	Recent Primary Infection

Table 3: Seroprevalence of HSV-2 IgM and IgG antibodies among pregnant women according to immune response:

Immune response		Number	%	Interpretation
IgM	IgG			
-	+	47	47.0	Previous Exposure
+	+	0	0	Primary Infection
-	-	53	53.0	Susceptible
+	-	0	0	Recent Primary Infection

The results of the serologic assays were categorised into four types of responses. The first category included women who were immune to CMV [IgG (+), IgM (−)], accounting for 67% of the

participants. The second category represented those with primary infection [IgG (+), IgM (+)], but no women fell into this group. The third group consisted of seronegative women [IgG (−), IgM (−)], making up 33% of the participants. The final category included those with recent infection markers [IgG (−), IgM (+)], and similarly, no cases were identified in this group (Table 2&3).

Table 4: Anti-Cytomegalovirus and Anti-herpes simplex type 2 seropositivity according to age

Age (years)	No of Cases	CMV IgM		CMV IgG		HSV-2 IgM		HSV-2 IgG	
		-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)
<20	21	21	Nil	5	16	21	Nil	15	6
		(100.0%)		(15.15%)	(23.9%)	(100.0%)		(26.3%)	(13.9%)
21-25	52	52	Nil	21	31	52	Nil	30	22
		(100.0%)		(63.64%)	(46.2%)	(100.0%)		(52.6%)	(51.2%)
26-30	23	23	Nil	7	16	23	Nil	12	11
		(100.0%)		(21.21%)	(23.9%)	(100.0%)		(21.1%)	(25.6%)
31-35	4	4	Nil	0	4	4	Nil	0	4
		(100.0%)			(6%)	(100.0%)			(9.3%)
Total		100		33(100%)	67(100%)			57(100%)	43(100%)
P-value		**0.248**				**0.063**			

The results also showed that the majority of Anti-CMV IgG seropositive women were in the age group of 21–25 years, accounting for 31 ((46.2%), followed by 16 (23.9%) in the 26–30 age group, 16 (23.9%) in those under 20 years, and 4 (6%) in the 31–35 age group. Regarding Anti-HSV-2 IgG seropositivity, 22 (51.2%) of the cases were in the 21–25 age group, 11 (25.6%) in the 26–30 age group, 6 (13.9%) in those under 20 years, and 4 (9.3%) in the 31– 35 age group (Table 4).

Table 5: Anti-Cytomegalovirus and Anti-herpes simplex type 2 seropositivity according to residence

Residence	No of Cases	CMV IgM		CMV IgG		HSV-2 IgM		HSV-2 IgG	
		-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)
	24	4	Nil	5	19	4	Nil	14	10
Urban		(100.0%)		(20.8%)	(79.2%)	(100.0%)		(58.3%)	(41.7%)
	76	76	Nil	28	48	76	Nil	43	33
Rural		(100.0%)		(36.8%)	(63.2%)	(100.0%)		(56.6%)	(43.4%)
P-value		**0.146**				**0.880**			

The study revealed that all pregnant women, regardless of their residence (urban or rural), educational level, or socioeconomic status, tested negative for both Anti-CMV IgM and Anti- HSV-2 IgM antibodies, indicating no recent infections. Anti-CMV IgG antibodies were predominantly found among women residing in rural areas, with 48 (63.2%) seropositive cases, followed by 19 (79.2%) in urban areas. Similarly, Anti-HSV-2 IgG antibodies were more prevalent in rural women (33; 43.4%) compared to urban women (10; 41.7%). Regarding educational status, Anti-CMV IgG seropositivity was highest among women with a high school education (31; 75.6%), followed by those with higher primary (20; 62.5%), illiterate (9; 64.3%), PUC (6; 60.0%), and primary school (1 case). For Anti-HSV-2 IgG, 17 positive cases were from the high school group, 11 (34.4%) from higher primary, 8 (57.1%) among illiterate, and 6 (60.0%) from the PUC group. In terms of socioeconomic status, Anti- CMV IgG antibodies were most commonly detected among women from the lower class (41; 69.5%), followed by lower middle class (11; 68.8%), upper middle class (7; 70.0%), middle class (6; 60.0%), and upper class (2; 40.6%). For Anti-HSV-2 IgG, seropositivity was observed in 22 (37.3%) women from the lower class, 11 (68.8%) from the lower middle class, 6 (60.0%) from the upper middle class, 3 (30.0%) from the middle class, and 2 (20.0%) from the upper class (Table 5,6 & 7).

Table 6: Anti-Cytomegalovirus and Anti-herpes simplex type 2 seropositivity according to educational level

Education	No of Cases	CMV IgM		CMV IgG		HSV-2 IgM		HSV-2 IgG	
		-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)
Illiterate	14	14 (100.0%)	nil	5 (32.7%)	9 (64.3%)	14 (100.0%)	nil	6 (42.9%)	8 (57.1%)
Primary	1	1 (100.0%)	nil	0	1 (100.0%)	1 (100.0%)	nil	0	1 (100.0%)
Higher Primary	32	32 (100.0%)	nil	12 (37.5%)	20 (62.5%)	32 (100.0%)	nil	21 (63.6%)	11 (34.4%)
High School	41	41 (100.0%)	nil	10 (24.4%)	31 (75.6%)	41 (100.0%)	nil	24 (58.5%)	17 (41.5%)
PUC	10	10 (100.0%)	nil	4 (40%)	6 (60.00%)	10 (100.0%)	nil	4 (40%)	6 (60.0%)
Degree	2	2 (100.0%)	nil	2	0	2 (100.0%)	nil	2 (100%)	0
P-value		**0.261**				**0.296**			

Table 7: Anti-Cytomegalovirus and Anti-herpes simplex type 2 seropositivity according to socio economic status

SES	No of Cases	CMV IgM		CMV IgG		HSV-2 IgM		HSV-2 IgG	
		-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)
Upper	5	5 (100.0%)	Nil	3 (39.4%)	2 (40.6%)	5 (100.0%)	Nil	4 (80%)	1 (20.0%)
Upper middle	10	10 (100.0%)	Nil	5 (30%)	7 (70.0%)	10 (100.0%)	Nil	4 (40%)	6 (60.0%)
Middle	10	10 (100.0%)	Nil	6 (40%)	6 (60.0%)	10 (100.0%)	Nil	7 (70%)	3 (30.0%)
Lower middle	16	16 (100.0%)	Nil	5 (31.2%)	11 (68.8%)	16 (100.0%)	Nil	5 (31.2%)	11 (68.8%)
Lower	59	59 (100.0%)	Nil	18 (30.5%)	41 (69.5%)	59 (100.0%)	Nil	37 (62.7%)	22 (37.3%)
P-value		**0.718**				**0.089**			

Table 8: Anti-Cytomegalovirus and Anti-Herpes simplex type 2 seropositivity according to duration of pregnancy

Trimester	No of Cases	CMV IgM		CMV IgG		HSV-2 IgM		HSV-2 IgG	
		-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)
1st Trimester	6	6 (100.0%)	nil	0	6 (100.0%)	6 (100.0%)	nil	1 (16.7%)	5 (83.3 %)
2nd Trimester	10	10 (100.0%)	nil	3 (30%)	7 (70%)	10 (100.0%)	nil	7 (70%)	3 (30%)
3rd Trimester	84	84 (100.0%)	nil	30 (33.7%)	54 (64.3 %)	84 (100.0%)	nil	49 (58.3%)	35 (41.7%)
P-value		**0.194**				**0.094**			

The study showed that all pregnant women, regardless of their trimester or parity, tested negative for both Anti-CMV IgM and Anti-HSV-2 IgM antibodies, indicating no recent infections. Among those tested for Anti-CMV IgG, 54 (64.3%) were seropositive in the third trimester, 7 (70.0%) in the second trimester, and all 6 (100.0%) in the first trimester. Similarly, Anti-HSV-2 IgG seropositivity was observed in 35 (41.5%) women in the third trimester, 3 (30.0%) in the second trimester, and 5 (83.3%) in the first trimester. Regarding parity, Anti-CMV IgG positivity was found in 41 (59.4%) nulliparous women, 24 (82.3%) primiparous women, and 2 (100.0%) multiparous women. For Anti-HSV-2 IgG, 28 (40.6%) nulliparous, 14 (48.3%) primiparous, and 1 (50.0%) multiparous woman tested positive (Table 8 & 9).

Table 9: Anti-Cytomegalovirus and Anti-Herpes simplex type 2 seropositivity according to parity

Trimester	No of Cases	CMV IgM		CMV IgG		HSV-2 IgM		HSV-2 IgG	
		-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)
Nullipara	69	69 (100.0%)	Nil	28 (40.6%)	41 (59.4%)	69 (100.0%)	Nil	41 (59.4%)	28 (40.6%)
Primip-ara	29	29 (100.0%)	Nil	5 (16.7%)	24 (82.3%)	29 (100.0%)	Nil	15 (51.7%)	14 (48.3%)
Mul-tipara	2	2 (100.0%)	Nil	0	2 (100.0%)	2 (100.0%)	Nil	1 (50%)	1 (50.0%)
P-value		**0.049**				**0.766**			

The study showed that all pregnant women, regardless of their parity or abortion history, were negative for both Anti-CMV IgM and Anti-HSV-2 IgM antibodies. Among those tested for Anti-CMV IgG, 61 (68.5%) of the 89 women with no history of abortion were seropositive. Among those with abortion history, 1 (25.0%) of 4 women with one abortion, 1 (100.0%) with two abortions, 3 (75.0%) of 4 with three abortions, 1 (100.0%) with two abortions and one intrauterine death, and another 1 (100.0%) with a history of intrauterine death were seropositive. Regarding Anti-HSV-2 IgG, 39 (43.8%) of women with no abortion history tested positive, while 2 (50.0%) of 4 women with a history of one abortion and 2 (50.0%) of 4 with three abortions were seropositive. These findings indicate a relatively consistent seroprevalence of Anti-CMV and Anti-HSV-2 IgG antibodies among women with or without abortion history, with no evidence of recent infection in any group (Table 10).

Table 10: Anti-Cytomegalovirus and Anti-Herpes simplex type 2 seropositivity according to History of abortions and IUD

Abortion	No of Cases	CMV IgM		CMV IgG		HSV-2 IgM		HSV-2 IgG	
		-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)	-Ve (%)	+Ve (%)
Nil	89	89 (100.0%)	Nil	29	61 (68.5%)	89 (100.0%)	Nil	50 (56.2%)	39 (43.8%)
A-1	4	4 (100.0%)	Nil	3 (75.0%)	1 (25.0%)	4 (100.0%)	Nil	2 (50.0%)	2 (50.0%)
A-2	1	1 (100.0%)	Nil	0	1 (100.0%)	1 (100.0%)	Nil	1 (100.0%)	0
A-3	4	4 (100.0%)	Nil	1 (25.0%)	3 (75.0%)	4 (100.0%)	Nil	2 (50.0%)	2 (50.0%)
D-1	1	1 (100.0%)	Nil	1 (100%)	0	1 (100.0%)	Nil	1 (100.0%)	0
A2D1	1	1 (100.0%)	Nil	0	1 (100%)	1 (100.0%)	Nil	1 (100.0%)	0
P-value		**0.268**				**0.784**			

Discussion

CMV has worldwide distribution and infects humans of all ages and socioeconomic group, with no seasonal or epidemic patterns of transmission. It is the most common cause of congenital infection and a common cause of deafness and intellectual impairment worldwide.

Herpes simplex type 2 infection in pregnant women can result in abortion, premature labour and congenital and neonatal herpes. Herpes simplex type 2 infection in the newborn are particularly sever and frequently involve the CNS.

One of the measures in disease control program is to provide accurate epidemiologic data through seroprevalence studies

In the present study 100 pregnant women attending antenatal clinic of Cheluvamba hospital were evaluated for the presence of anti CMV IgM, IgG antibodies and anti HSV-2 IgM, IgG antibodies in serum by ELISA technique. The results are compared and discussed with other studies.

Table 11: Comparison of seroprevalence of anti CMV IgM and IgG antibodies of present study with other studies

S. No.	Name of The Author	Year	Place	Seropositive	
				IgM	IgG
1	Emovan E.O et al [6]	2013	Nigeria	4%	92%
2	Khairi S et al [7]	2013	Sudan	6%	97.5%
3	Neirukh T et al [8]	2013	Palestine	- -	96.6%
4	Nyamache AK et al [9]	2014	Kenya	8.1%	77.3%
5	Hamid K.M. et al [10]	2014	Nigeria	- -	91.1%
6	Mamuye Y et al [11]	2015	Ethiopia	15.5%	88.5%
7	Umeh EU et al [12]	2015	Nigeria	3.5%	93.3%
8	Umeora OUJ & Anuma ON [13]	2016	Nigeria	43.6%	94.6%
9	Waseem H et al [14]	2017	Islamabad	30%	99.4%
10	Kumar MC et al [15]	2017	Western India	9.4%	83.0%
11	Jinn Q et al [16]	2017	China	1.28%	94.70%
12	**Present study**	**2017**	**Mysore**	**0**	**67.0%**

In the present study the seroprevalence of anti CMV Ig G antibodies was (67.0%) and the seroprevalence of anti CMV Ig M was 0 which is comparable with other studies done by Maumaye Y et al and Nayamache AK et al.

Table 12: Comparison of seroprevalence of anti HSV-2 IgM and IgG antibodies of present study with other studies

S. No.	Name of The Author	Year	Place	Seopositivity	
				IgM	IgG
1	Hasan et al [17]	2013	Diyal proinenece	2.2%	2.2%
2	Bochner AF et al [18]	2013	Mysore taluk	-	67.0%
3	Kalu IE et al [19]	2014	Nigeria	47.3%	47.3%
5	Cisse B et al [20]	2015	Yopougan		96.5%
6	Idress HEA et al [21]	2015	Sudan	2.2%	63.3%
7	Okonko IO et al [22]	2015	Nigeria		99.4%
8	Anjulo AA et al [23]	2016	Ethiopia	-	31.0%
9	Lima LRP et al [24]	2016	Brazil	2.2%	20.6%
10	**Present study**	**2017**	**Mysore**	**-**	**43.0%**

In this study the seroprevalence of anti HSV-2 Ig G was (43.0%) which is comparable with Kalu IE et al 47.3%.

Table 13: Comparison of maximum age group affected in Anti CMV antibodies tested cases of present study with other study

	Maximum age group affected		CMV IgM	CMV IgG
Name of the Author	**Age group**	**(%)**	**Positive (%)**	**Positive (%)**
Emovan et al. [6]	20-30	66.00	-	60.50
Khairi et al. [7]	20-29	39.00	2	38.00
Nyamache et al. [9]	26-30	36.00	2.5	38.50
Hamid KM et al. [10]	25-28	58.00	-	26.00
Mamuye Y et al. [11]	20-25	43.50	6	32.00
Umeh EU et al. [12]	21-30	70.90	5	65.80
Kumar CM et al. [15]	18-40	90.60	8	83.82
Present study	**21-25**	**52.00**	**-**	**59.6**

In the present study maximum age group affected was 21- 25 years (52.0%) among them Anti CMV IgG was positive in 59.6% Which is comparable with Umeh EU et al and Emovan et al. all the tested cases were negative for Anti CMV IgM antibodies.

Table 14: Comparison of residence of pregnant women in Anti CMV antibodies tested cases of present study with other studies

Name of The Author	Number of cases (%)		CMV IgM Positive (%)		CMV IgG Positive (%)	
	Urban	Rural	Urban	Rural	Urban	Rural
Nyamache et al. [9]	42.7	57.3	8.1	8.1	75.7	78.5
Waseem et al. [14]	62.8	37.2	56.6	43.3	62.6	37.4
Present study	**24.00**	**76.00**	**-**	**-**	**79.16**	**63.15**

In the present study (76.0%) were from rural area and (24.0%) were from urban area, CMV IgG Was positive in (79.16 %) of urban and (63.15%) of rural area. which is comparable with other studies conducted by Waseem et al and Nyamache et al. all the tested cases were negative for Anti CMV IgM antibodies.

Table 15: Comparison of Trimester wise distribution of Anti CMV antibodies tested cases of present study with other studies

Name of the author	Trimester (%) Number of cases			CMV IgM Positive (%)			CMV IgG Positive (%)		
	First	Second	Third	First	Second	Third	First	Second	Third
Emoven EO et al. [6]	12	27.5	60.5	-	-	-	93.6	87.5	92.8
Nyamache et al. [9]	50.4	49.6	-	6.9	9.3	-	77.1	77.5	-
Hamid KM et al. [10]	3.3	22.2	63.3	-	-	-	100	86.7	93.0
Mamuye Y et al. [11]	8.5	22.0	69.5	5.8	18.18	15.8	99.1	86.3	88.48
Umeh E U et al. [12]	11.7	50.1	38.1	2.5	3.7	3.5	88.6	93.6	94.4
Present study	**6**	**10**	**84**	**-**	**-**	**-**	**100**	**70.0**	**64.3**

In the present study among Cmv IgG tested cases, in first trimester (100%) were positive, in second trimester (70.0%) were positive, in third trimester (64.30%) were positive which is comparable with other studies done by Mamuye et al, Hamid et al, Emoven et al. all the tested cases were negative for Anti CMVIg M antibodies.

Table 16: Comparisons of parity wise distribution of Anti CMV antibodies tested cases of present study with other studies

Name of the author	Parity (%)			CMV IgM Positive (%)			CMV IgG Positive (%)		
	Nulli para	Primi para	Multi para	Nulli para	Primi para	Multi para	Nulli para	Primi para	Multi para
Emovan EO et al. [6]	55	24	21	-	-	-	93.6	87.5	92.8
Mamuye Y et al. [11]	32.5	7.5	60.0	16.9	6.6	15.8	86.15	93.3	89.16
Umeh EU et al. [12]	34.6	29.06	36.26	0	4.6	9.4	88.5	92.5	98.5
Present study	**69.0**	**29.00**	**2.00**	**-**	**-**	**-**	**59.4**	**82.8**	**100**

In the present study among CMV Ig G tested cases (59.40%) were positive in nullipara, (82.80%) were positive in primipara, (100%) were positive in multipara. Which is comparable with other studies done by Umeh et al and Maumye et al. all the tested cases were negative for Anti HSV-2 Ig M antibodies.

Table 17: Comparison of distribution of history of abortion in Anti CMV antibodies tested cases of present study with other studies

Name of the author	History of abortion		CMV IgM Positive (%)	CMV IgG Positive (%)
	Yes	No	Yes	Yes
Mamuye Y et al. [11]	24.0	76.0	22.5	25.4
Umeora OUJ & Anuma ON [13]	38.4	61.6	36.7	38.6
Present study	**10**	**90.0**	**-**	**60.0**

In present study among CMV IgG tested cases (60.0%) were positive in case of aborted cases which is comparable with other studies done by Umeora OUJ & Anuma ON [13] and all the tested cases were negative for Anti CMV IgM antibodies.

HSV

Table 18: Comparison of maximum age group affected in Anti HSV-2 antibodies of present study with other studies

Name of the Author	Maximum age group affected		CMV IgM	CMV IgG
	Age group	(%)	Positive (%)	Positive (%)
Hasan AR et al. [17]	20-29	64.63	2.2	1.1
Bocher AF et al. [18]	18-28	48.89	-	6.1
Kalu IE et al. [19]	26-39	36.4	-	37.5
Idress HAE et al. [21]	18-25	46.7	-	66.6
Okono IO et al. [22]	26-30	40.6	2.8	100
Anjulo AA et al. [23]	20-24	34.1	-	24.41
Present study	**21-25**	**52.00**	**-**	**42.3**

In present study in HSV-2 IgG Tested cases maximum age group affected was between 21-25 years among them (42.3) % were positive this is comparable with other studies like Kalu IE et al and others. all the tested cases were negative for Anti HSV-2 IgM antibodies.

Table 19: Comparison of Trimester wise distribution of Anti HSV-2 antibodies tested cases of present study with other studies

Name of the author	Trimester (%) Number of cases			HSV-2 IgM Positive (%)			HSV-2 IgG Positive (%)		
	First	Second	Third	First	Second	Third	First	Second	Third
Hasan AR et al. [17]	17.58	36.26	46.15	1.1	1.1	0	0	1.1	1.1
Kalu IE et al. [19]	14.7	39.8	45.5	-	-	-	-	-	-
Idress HE et al. [21]	55.6	60.1	5.6	1.7	3.7	0	62.6	74.0	20.0
Okonko IO et al. [22]	15.6	51.7	32.8	-	-	-	100	98.9	100
Lima LP et al. [24]	8.1	43.4	48.5	-	-	-	-	-	-
Present study	**6.0**	**10.0**	**84.0**	**-**	**-**	**0**	**83.3**	**30.0**	**41.7**

In the present study among HSV-2 IgG tested cases, in first trimester (83.3%) were positive, in second trimester (30.00%) were positive, in third trimester (41.7%) were positive which is comparable with other studies. all the tested cases were negative for Anti HSV-2 IgM antibodies.

In the present study among HSV-2 IgG tested cases (40.6%) were positive in nullipara, (48.30%) were positive in primipara, (50.00%) were positive in multipara. Which is comparable with other study done by Kalu IE et al. [19] in whose study (40.60%) were positive in nullipara, (48.30%) were positive in primipara, (48.71%) were positive in multipara. all the tested cases were negative for Anti HSV-2 IgM antibodies.

In present study among HSV-2 IgG tested cases (40.00%) were positive in case of aborted cases which is comparable with other studies Anjulo AA et al. [23] in whose study the prevalence was (4%) and Hasan AR et al. [17] in whose study the prevalence was (1.1%). all the tested cases were negative for Anti HSV-2 IgM antibodies.

Conclusion

Infections like CMV and HSV-2, though often mild in pregnant women, can lead to severe and lifelong complications in newborns, including congenital anomalies, developmental delays, and stillbirths. Despite this, awareness and routine screening for these infections remain low, especially in countries like India. Implementing voluntary antenatal screening, coupled with education on hygiene and preventive behaviour's, can significantly reduce transmission risks. Early detection allows timely intervention, improving outcomes for both mother and child. Educating women of reproductive age, promoting safe practices, and screening blood products for at-risk groups are essential steps. These measures are practical, cost-effective, and can dramatically lower the burden of congenital infections. A coordinated public health approach is urgently needed to protect future generations and ensure healthier pregnancies.

Declaration

Ethics approval and consent to participate: The study was approved by The Institutional Ethics Committee (IEC). All procedures were followed in compliance with applicable rules and regulations. Everyone who participated, including their legal guardian(s), gave their informed consent.

Consent for publication: Everyone who participated, including their legal guardian(s), gave their informed consent.

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