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Evaluation of TORCH Seropositivity as a Risk Factor for Bad Obstetric History: A Study from GMC Amritsar

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ABSTRACT

Background: TORCH infections (Toxoplasma gondii, Rubella, Cytomegalovirus, and Herpes Simplex Virus) are significant causes of adverse obstetric outcomes. This study aimed to evaluate the seroprevalence of TORCH agents and their correlation with Bad Obstetric History (BOH) in pregnant women in the Punjab region.Materials and Methods: A prospective hospital-based study was conducted at GMC Amritsar, involving 118 women with BOH (recurrent pregnancy loss, intrauterine fetal death [IUFD], stillbirth, or congenital anomalies). Serum samples were analyzed for IgM and IgG antibodies against TORCH agents using Enzyme-Linked Immunosorbent Assay (ELISA). Statistical analysis was performed using SPSS v20, with $p < 0.05$ considered significant.Results: Among 118 patients, IgM seropositivity was highest for HSV-I (40%) and HSV-II (38%), followed by Rubella (4.23%) and CMV (1.7%). IgG seropositivity was most prevalent for Rubella (84%) and CMV (72%). A significant correlation was observed between TORCH seropositivity and adverse outcomes; 100% of cases involving early neonatal death and congenital anomalies were TORCH positive. Most acute infections (IgM positive) were clustered in the first trimester ($p < 0.05$).Conclusions: High seroprevalence of HSV and Rubella highlights the need for routine TORCH screening in early pregnancy, particularly for women with BOH. Universal rubella vaccination and improved antenatal screening are critical to reducing perinatal morbidity in this region.

Keywords: TORCH complex, Bad Obstetric History, Seroprevalence, Enzyme-Linked Immunosorbent Assay, North India

INTRODUCTION

Numerous organisms can cause recurrent pregnancy loss due to maternal infections transmissible in utero[1]. To draw attention to infections causing prenatal and congenital diseases, Nahmias et al. (1971) proposed the abbreviation TORCH[1]. TORCH stands for Toxoplasma gondii, Others (including T. pallidum, Varicella zoster, Parvovirus B19, HIV), Rubella virus, Cytomegalovirus (CMV), and Herpes simplex virus type 2 (HSV-2). A bad obstetric history (BOH) is defined as two or more consecutive spontaneous abortions, IUFD, intrauterine growth restriction, stillbirth, early neonatal death, and/or congenital anomalies. Although only 10–30% of expectant mothers are classified as high-risk, they account for 70–80% of perinatal deaths and morbidities[2].

Toxoplasma gondii infection can cause severe ocular or central nervous system damage in infants. Later gestational infections are more likely to affect the fetus, while early infections may result in miscarriage or severe anomalies[3], [4], [5]. High prevalence has been reported among pregnant women from Latin America, Eastern/Central Europe, the Middle East, Southeast Asia, and Africa[6].

Rubella affects 0.1–2% of neonates, and infection during the first eight weeks of gestation carries the highest risk of congenital defects such as deafness and blindness[7], [8]. CMV infection can lead to hearing loss, mental retardation, pneumonia, hepatitis, or hematologic disorders[9]. The incidence of congenital CMV ranges from 0.5–3% of all live births. Herpes simplex virus infection poses a risk if transmitted during delivery but generally does not affect fetal health[2].This study aims to assess TORCH serostatus and related risk factors among women with BOH to identify infection patterns and pathogen-specific variations.

MATERIALS AND METHODS

This prospective, hospital-based study included 118 women with BOH attending the antenatal clinic in the Department of Obstetrics and Gynaecology, Government Medical College, Amritsar. Inclusion criteria were women with two or more consecutive spontaneous abortions, IUFD, preterm labour, stillbirth, polyhydramnios, congenital anomalies, or primary/secondary infertility, who provided informed consent. Exclusion criteria included women with gestational diabetes, preeclampsia, Rh incompatibility, ectopic pregnancy, or low amniotic fluid.

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Five millilitres of venous blood were collected aseptically. Serum was separated by centrifugation and stored at −20 °C until testing. IgG and IgM antibodies against T. gondii, Rubella virus, CMV, and type-specific IgG antibodies of HSV-2 were detected by ELISA. The kits used were: Rubella IgG/IgM (HIGHTOP, China), CMV IgG/IgM (HIGHTOP, China), Toxoplasma gondii IgG/IgM (QUALISA, UK), and HSV IgG/IgM (CALBIOTECH, Germany). All assays were performed per manufacturer's guidelines with appropriate controls. Data were analyzed using SPSS v20 (IBM, USA). Frequencies and percentages were used for categorical variables. Comparisons were made using the Chi-square test, ANOVA, Student's t-test, and Pearson's correlation. $p < 0.05$ was considered statistically significant.

RESULTS

A total of 118 women with Bad Obstetric History (BOH) were evaluated for TORCH-specific antibodies. The cohort demonstrated a high overall seroprevalence of TORCH agents, with varying patterns between acute (IgM) and past (IgG) infections.

Seroprevalence Profile

The serological distribution is summarized in **Table 1**. The highest acute infection rate was observed for Herpes Simplex Virus, with IgM positivity rates of 40% (n=47) for HSV-I and 38% (n=44) for HSV-II. In contrast, *Toxoplasma gondii* (1.6%), CMV (1.7%), and Rubella (4.23%) showed significantly lower IgM prevalence (**Fig. 2**).

Regarding past exposure, Rubella exhibited the highest IgG seropositivity (84%), followed by CMV (72%) and HSV-I (57%). *Toxoplasma gondii* IgG was detected in 11.8% of the participants. Co-seroprevalence for multiple agents, specifically CMV and Rubella, was recorded in nearly 4.23% and 1.7% of the cases.

Table 1. Serological data of IgM and IgG antibodies against various TORCH agents in patient with BOH.

TORCH AGENT	IgM n(%)	IgG n(%)	Total n(%)
Toxoplasma gondii	3(1.6%).	14(11.8%)	17(13.4%)
Rubella	5(4.23%)	99(84%)	104(88.23%)
Cytomegalovirus	4(1.7%)	84(72%)	86(73.4%)
HSV1	47(40%)	67(57%),	114(97%)
HSV2	44(38%)	64(54%)	108(92%)

Chi square: 75.01 DF:8 P value:0.001

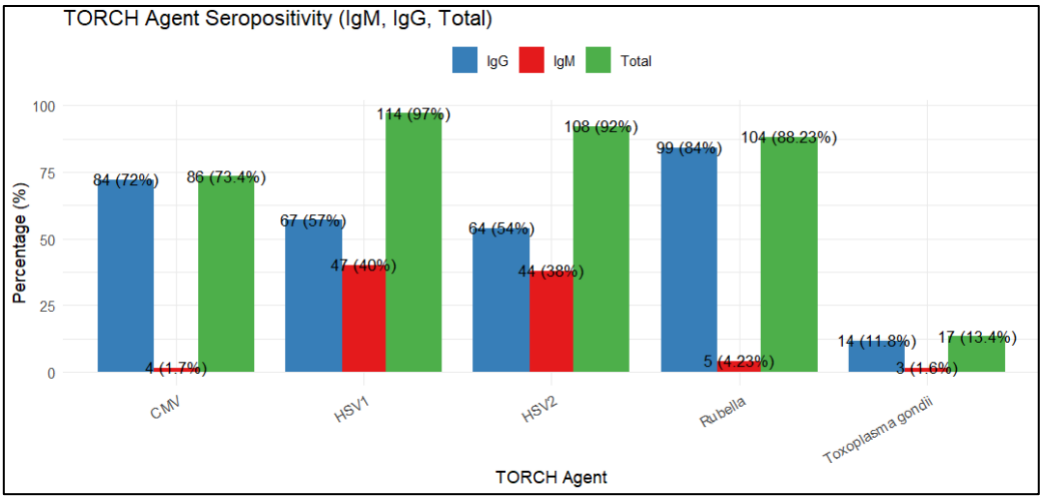

Fig 1: Histogram showing the comparison of IgM and IgG seropositivity across the TORCH complex.

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Trimester-wise Distribution

The analysis of infection timing revealed that acute infections (IgM positive) were predominantly clustered in the first and second trimesters (**Table 2**). Statistical significance was observed for the clustering of *Toxoplasma* (p=0.008), CMV (p=0.0023), and Rubella (p=0.003) in early pregnancy (**Fig. 2**). HSV-I and HSV-II IgM levels remained consistently high across the first two trimesters but did not show a significant trimester-specific decline (p=0.52).

Table.2 Frequency of TORCH positive according to trimesters of pregnancy

Period of gestations	Total No. (%)	Toxo. gondii		CMV		Rubella		HSV1		HSV2	
		IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG
First trimester	58 (49.15%)	2 (23.6%)	6 (7.08%)	3 (3.54%)	23 (27.14%)	3 (3.54%)	44 (51.92%)	24 (28.32%)	31 (36.88%)	22(25.96%)	23(27.14%)
Second trimester	34 (40.12%)	1 (1.18%)	7 (8.26%)	1 (1.18%)	44 (51.92%)	1 (1.18%)	37 (43.66%)	8 (9.44%)	17 (20.06%)	14(16.52%)	12(14.16%)
Third trimester	26 (30.68%)	0(0)	1 (1.18%)	0	17 (20.06%)	1 (1.18%)	18 (21.24%)	15 (17.70%)	14 (16.52%)	8(9.44%)	11(12.98%)
Total	118	3 (3.54%)	14 (16.52%)	4 (4.72%)	84 (99.12%)	5 (5.90%)	99 (116.82%)	47 (55.46%)	67(79.06%)	44(51.92%)	64(75.52%)
P-Value		**0.008**		**0.0023**		**0.003**		**0.52**			

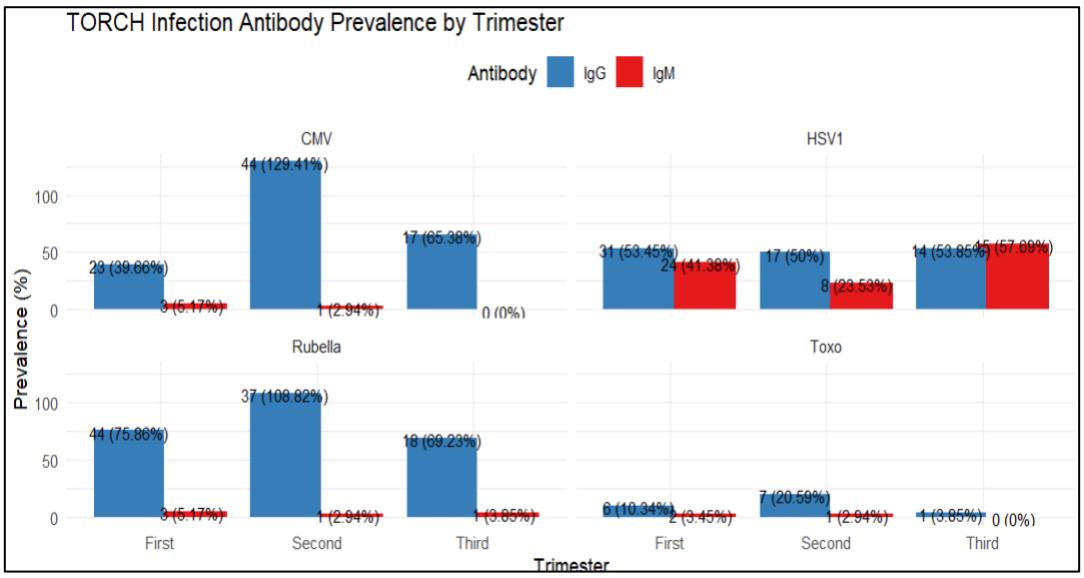

Fig 2: Distribution of acute TORCH infections (IgM) by gestational trimester.

Correlation with Obstetric Outcomes

Clinical categorization of the participants showed that consecutive abortions were the most common adverse outcome (82%). A highly significant correlation was found between TORCH seropositivity and the severity of BOH ($\chi^2 = 96.78$, $p < 0.00001$).

As detailed in Table 3, 100% of cases involving early neonatal death (n=14) and congenital anomalies (n=10) were seropositive for at least one TORCH agent. High seropositivity was also noted in cases of stillbirth (93.7%) and consecutive abortions (90.6%). The direct relationship between infection and outcome severity is illustrated in Fig. 3.

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Table 3: Magnitude of TORCH Infections Across Clinical Categories

BAD OBSTETEIC HISTORY	TOTAL NUMBER=118 n (percentage)	TORCH POSITIVE n(%)	TORCH NEGATIVE n(%)
Consecutive abortions	97(82%)	87(90.6%)	10(9.32%)
IUFD	18 (15.8%)	14(83.78%)	4(16.21%)
Stillbirth	16(13.6%)	1(93.7%)	2(6.25%)
Early neonatal Death	14(12.3%)	14(100%)	0
Congenital anomalies	10(8.5%)	10(100%)	0
Preterm labour	0	0	0

Chi-square statistic (χ^2) ≈ 96.78, p-value ≈ < 0.00001

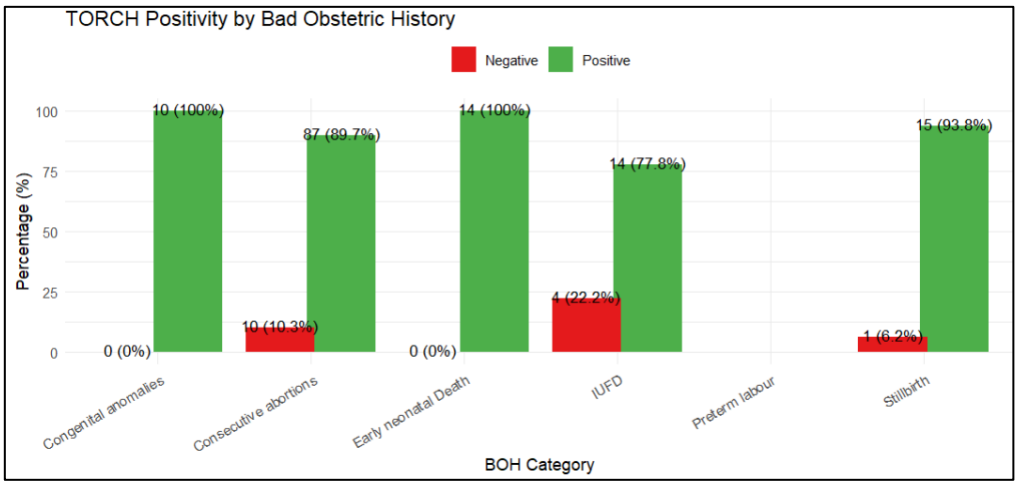

Fig 3: Percentage of TORCH seropositivity correlated with specific adverse obstetric outcomes.

Among them, Seropositivity against TORCH agent was found maximum in women with early neonatal death and congenital anomalies(100%) each, followed by patients with still birth (93.75%), preterm labour patient(92.3%) and patients with consecutive abortion(90.6%). The association between various BOH etiologies with types of antibody for TORCH complex infection is shown in Table 4. These rates show very strong associations between TORCH infection seropositivity and poor obstetric outcomes[10], [11], [12].

Table 4: The association between various BOH etiologies with types of antibody for TORCH complex infection

BOH	T.gondii		Rubella		CMV		HSV1		HSV2	
	IgM n(%)	IgG n(%)	IgM n(%)	IgG n(%)	IgM n(%)	IgG n(%)	IgM n(%)	IgG n(%)	IgM n(%)	IgG n(%)
Abortions N=97	0	0	8 (9.2%)	49 (51%)	4 (5.14%)	64 (67%)	7 (9%)	39 (41%	26 (29%)	7 (10%)
Still birth N=14	0	0	2 (13.5%)	8 (70%)	1 (8.14%)	10 (7%)	3 (21%)	7 (50%)	3(21%)	1(6%)
IUFD N=14	2 (13%)	2 (13%)	2 (13%)	10 (70%)	2 (13%)	9 (70%)	4 (30%)	7 (50%)	2 (6%)	3 (15%)
Early neonatal death N=14	1 (5%)	1 (5%)	3 (34.4%)	7 (50%)	1 (3%)	10 (80%)	2 (6%)	5 (40%)	2 (6%)	1 (3%)
Congenital anomalies N=10	1 (10%)	1 (10%)	4 (40%)	7 (70%)	8 (80%)	0	5 (50%)	5 (50%)	2 (20%)	1 (10%)
Preterm labour	0	0	0	0	0	0	0	0	0	0

Chi square: 78.365; P-Value : 0.000056 ; Degree of Freedom: 36

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DISCUSSION

Maternal infections are a major cause of miscarriage in patients with a bad obstetric history (BOH)[2]. In table 1, it can be seen that the seroprevalence of TORCH agents in BOH patients is noteworthy. In our research, we found that the seroprevalence of toxoplasma is 17%, rubella 88.23%, CMV 73.4%, HSV1 97%, and HSV2 92%. In a similar study in eastern India, the values for these infections were 19.2% for toxoplasma, 55.9% for rubella, 70.51% for CMV, 42.3% for HSV1 and 29.9% for HSV2[3]. This might be due to geographic distribution and poor socioeconomic status and hygiene conditions of people of Punjab. Early diagnosis through serology, counseling, vaccination (for rubella), and appropriate treatment remain critical components in reducing pregnancy losses and congenital infections[4].

In table 2, the trimester-wise distribution of TORCH infections in pregnant women with bad obstetric history (BOH), highlighting varying susceptibility and immune responses across gestational stages were seen. The data reflect distinct patterns of infection, with notable implications for maternal and fetal health. The findings emphasize the significance of early screening, particularly during the first trimester, where most infections appear to cluster[5]. Toxoplasma gondii IgM positivity was highest in the first trimester (3.54%), with decreasing frequency in later stages. IgG seropositivity (16.52%) suggests prior exposure, while the IgM trend aligns with the critical window for congenital toxoplasmosis transmission. Notably, similar trimester-specific vulnerability was reported by a study in 2014, who found the highest rate of acute toxoplasmosis in the first trimester, emphasizing its association with spontaneous abortions and fetal malformations if left untreated[5].

Cytomegalovirus (CMV) IgG seropositivity was very high (99.12%) across trimesters, indicating widespread past exposure. CMV IgM was low (4.72%) but more common in early pregnancy, which supports similar previous findings of a study in 2014 that CMV reactivation or reinfection during the first trimester can affect fetal development, especially in women with BOH[6]. Rubella IgG antibodies were present in 84 cases (116.82%), suggesting high immunity levels, likely due to vaccination or past infection. However, the presence of IgM (5.90%)—especially in the first trimester—raises concerns about recent infections. Singh et al.[2] also reported similar rubella IgM positivity in early pregnancy, underlining its potential to cause congenital rubella syndrome during organogenesis[7], [8].

Herpes Simplex Virus (HSV1 and HSV2) showed high IgM and IgG prevalence, particularly during the first and second trimesters. HSV1 IgM was present in 36.88% of first-trimester cases, and HSV2 in 27.14%. Singh et al. observed comparable trends, indicating HSV as a frequent reactivating virus in BOH cases, with primary or reactivated infection in early pregnancy linked to miscarriage and fetal anomalies[9].

In conclusion, our findings reinforce the importance of first-trimester TORCH screening. The high IgM positivity in early pregnancy for all TORCH agents, especially HSV and toxoplasmosis, mirrors Singh et al.'s study[2] and underlines their potential role in poor obstetric outcomes.In table 3, among the 118 women analyzed, a striking 90.6% of those with consecutive abortions were TORCH positive, indicating a strong correlation between recurrent pregnancy loss and TORCH etiologies[10].

The most common adverse outcome in our study was consecutive abortions (82%), with 90.6% testing positive for one or more TORCH agents. This is consistent with findings by studies in 2014, who reported that TORCH infections—particularly Toxoplasma gondii, Rubella, and CMV—are significantly associated with recurrent miscarriages, often due to either primary maternal infection or reactivation of latent infections during early pregnancy[11]. Intrauterine fetal death (IUFD) was observed in 15.8% of cases, with 83.78% TORCH positivity. Similarly, stillbirth occurred in 13.6% of women, with 93.7% positivity. These findings echo the study by Rai et al. (1998), which established a high seroprevalence of TORCH infections in women with stillbirths and IUFD, attributing the fetal demise to vertical transmission of pathogens during the first or second trimester[10].

Alarmingly, all cases of early neonatal death (12.3%) and congenital anomalies (8.5%) in our cohort were TORCH positive (100%). This suggests an extremely strong correlation between TORCH pathogens and fetal developmental disorders, particularly rubella and CMV, which are known to cause sensorineural deafness, cardiac defects, and neurodevelopmental delays when contracted during early gestation[9], [11], [12]. The absence of preterm labor in our study cohort limits the ability to assess its association with TORCH, although previous literature suggests that CMV and HSV can also contribute to premature delivery[11]. In India, in 2014, CMV IgM was detected in 77.7% of babies with anomalies, and Rubella IgG in 66.6%—strongly supporting the present findings[13].

The Table 4 explores the relationship between TORCH infections and various etiologies of Bad Obstetric History (BOH), including abortions, stillbirths, intrauterine fetal death (IUFD), early neonatal deaths, and congenital anomalies. The findings demonstrate a substantial prevalence of TORCH seropositivity—especially IgG antibodies for CMV, Rubella, and HSV1/2—indicating prior exposure, while IgM positivity in a significant subset reflects recent or ongoing infections, posing potential risks to fetal development[13]. Among women with recurrent abortions (n=97), Rubella IgG (51%) and CMV IgG (67%) were notably high. Rubella IgM was also present in 9.2% of cases. These results align with international findings from Garly et al. (2000, The Lancet),

who reported that rubella and CMV infections, particularly in the first trimester, are linked to spontaneous abortions due to transplacental infection and immune-mediated fetal damage[4], [8].

In stillbirth and IUFD cases, CMV and Rubella IgG were predominant (70% each), with 13–30% IgM positivity across TORCH agents. Similar trends were reported in studies in 2002, who emphasized that both primary CMV infection and viral reactivation in pregnancy can cause intrauterine growth restriction, IUFD, and placental dysfunction, often in seropositive women[7], [11]. Cases of early neonatal death showed high CMV IgG (80%) and HSV1 IgG (40%), suggesting perinatal transmission of latent or reactivated viruses[9], [13]. Similar study in India 2008, Rubella IgG was 70%, and CMV IgG was also 70%; low IgM positivity suggests prior infection. The detection of Rubella IgM (34.4%) in this group reinforces the teratogenic impact of rubella when contracted near delivery, as shown by Best et al. (2007, Bulletin of the WHO), who documented ongoing rubella-related perinatal mortality in countries without universal immunization[8]. In similar study in India, CMV IgG in 61.1%, Rubella IgG in 58.3%, and Toxoplasma IgM in 11.1% among women with IUFD, shows close correlation with present data[6], [13].

The highest seropositivity was seen in women with congenital anomalies: CMV IgM (80%), Rubella IgG (70%), and HSV1 IgG/IgM (50%). These findings strongly support the known role of congenital CMV and rubella in causing fetal malformations, as reported in USA 2007, who concluded that congenital CMV is the leading infectious cause of developmental delay and sensorineural hearing loss globally[11]. In a similar study in India 2014, CMV IgM was detected in 77.7% of babies with anomalies, and Rubella IgG in 66.6%—strongly supporting the present findings[13]. Interestingly, no TORCH antibodies were observed in cases of preterm labor in our cohort, contrasting with studies in Africa, which linked subclinical CMV and HSV infections with preterm delivery and premature rupture of membranes, suggesting the need for further population-specific research.[10]

CONCLUSION

Rubella, CMV, and HSV have the highest association with BOH in Indian women. These findings mirror large national and international studies[2], [3], [9], demanding routine TORCH screening for at-risk pregnancies. Universal Rubella vaccination and antenatal CMV education are strongly advised to reduce these adverse outcomes.

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Conflict of Interest Statement: All authors have nothing else to disclose.