

Original Research Article

Seroprevalence of TORCH infection among pregnant women

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ABSTRACT

Background: TORCH infection complex during pregnancy has bad obstetric outcomes starting from low birth weight to congenital anomalies, sensory neural deafness, mental retardation, cerebral palsy and sometimes to fatal outcomes like abortion and still birth. As these diseases remain mostly asymptomatic these are rarely tested during pregnancy. Serology is the mainstay of diagnosing these infections..

Methods: A cross sectional study was undertaken to estimate the burden of these infections in a rural belt of western Odisha where majority of the population depend upon agricultural work. A total number of 402 antenatal cases were screened by ELISA test for presence of IgG&IgM antibodies against toxoplasma, rubella virus, cytomegalovirus (CMV), herpes simplex virus (HSV) 1 & 2; RPR test was done to know seroprevalence of Syphilis.

Results: It was found that Rubella is the most predominant infection being positive in 69.1% of the cases (IgG 68.4%, IgM 0.5%, and both IgG&IgM 0.25%), followed by CMV infection-66.7% (IgG 57.2%, IgM 1.7%, both 7.7%), Toxoplasma infection-39.8% (IgG 38.3%, IgM 0.7%, both 0.7%), HSV 1-23.6% (IgG 21.1%, IgM 2%, both 0.25%) and HSV 2 – 13.2% (IgG 11.7%, IgM 1.6%, both 0.25%). The seoprevalence of syphilis by RPR was least common with 0.5%.

Conclusions: This study showed that most of the infections have occurred by 20 years of age and before or during the 1st pregnancy. It is less common among the antenatal cases who have better education and have spouses servicing in private or government sectors signifying the more health and sanitation awareness among this group.

Keywords: TORCH, Cogenital infection, Toxoplasma, Rubella, Cytomegalovirus infection, Herpes simplex

INTRODUCTION

TORCH infection complex comprises of infections caused by toxoplasma gondii, rubella virus, cytomegalovirus (CMV) & herpes simplex virus (types 1 and 2). These infections and syphilis in the mother are transmissible in utero at several stages of pregnancy and are associated with adverse foetal outcomes and reproductive failure. Congenital infection by Toxoplasma is particularly severe if the mother acquires the infection during first or second trimester of pregnancy.¹⁻⁶ A trivial viral exanthematous disease in the adults, Rubella may have a drastic outcome on the reproductive health and

foetal outcome. At least 20% of the infants infected with Rubella in utero are born with multiple congenital anomalies like sensory neural deafness, congenital heart disease, microcephaly, mental retardation cataract and blindness, etc. and nearly 10% of the babies die by their first birthday.⁶⁻⁹ Cytomegalo virus (CMV), a virus belonging to the Herpes viridae family may be a major cause of congenital anomalies in the new-born. Though rare it may be responsible for severe fetal anomalies like chorioretinitis, sensorineural deafness and cerebral palsy.⁶⁻⁹ Genital herpes caused mainly by herpes simplex virus type 2 and 1 during last trimester of pregnancy may be responsible for disseminated neonatal herpes with a

case fatality of as high as 80%. Last 2 decades has witnessed a declining trend of HSV 2, but not HSV 1.^{6,7,9,10} Syphilis the harbinger of STDs was one of the bacterial diseases transmissible transplacentally. It may be a cause of various congenital anomalies in the fetus. Due to massive campaign and screening programmes to control HIV and STDs and ready availability of antibiotics it is showing a downward trend.^{11,12} Most of these infections remain asymptomatic and clinical diagnosis is unreliable. The diagnosis of these infections is mainly based upon the presence of serum antibodies, particularly IgM in patient's serum.

Data from various parts of India and abroad show considerable variation depending upon the geographic area, socioeconomic status, life style of the subjects and ease of access to diagnostic facilities. No baseline data of these infections in the local population of Western Odisha is available. Hence this research project is conceived with an aim to assess the prevalence of these infections among pregnant women in a rural block of western Odisha.

METHODS

A cross-sectional study was carried to assess the seroprevalence of TORCH infections among pregnant women in a rural area covering 22 subcentres during the period from December 2016 to November 2017. A total number of 402 antenatal cases (ANC) were recruited into the study during their visit to the subcentre during VHND (village health & nutrition days) and immunisation days. They were selected randomly. Due care was taken to maintain the confidentiality of the participants. Due approval from Institutional Ethical Committee (IEC), was obtained. Permission from the CDMO and Medical

Officer of the concerned area were taken prior to actual study. After the objective of the study was explained to them and informed consent was obtained, data were recorded in a pretested proforma / study questionnaire which contained the demographic data, socioeconomic and literacy status, obstetric history etc. The blood specimens collected from the subjects in the field were transported to the microbiology laboratory where serum was separated and tested for presence of IgG and IgM antibodies against the the toxoplasma, rubella, cytomegalovirus, herpes simplex virus 1 and 2 by ELISA method. "Novalisa" ELISA kits manufactured by Novatec Immunodiagnostica GmbH, Germany were used for testing and SOPs prepared as per manufacturer's instruction for ELISA tests was followed for testing and interpretation. RPR test was used to know the seroprevalence of syphilis infection. The bio wastes so generated were disposed as per existing standard guidelines. The results were recorded in laboratory registers and analysed. The laboratory test reports were despatched to the patients.

RESULTS

Table 1 depicts the sero-prevalence of different TORCH infections among the pregnant women. Considering either or both IgG and IgM as markers it is observed that Rubella is the most prevalent (69.1%) followed by CMV (66.7%), toxoplasma (39.8%), HSV 1 (23.6%) and HSV2 (13.2%) infection. Out of these only 1.5%, 0.75%, 9.5%, 2.5% and 1.5% have recently seroconverted as interpreted from the IgM results. Syphilis sero-prevalence is least common, constituting only 2 (0.5%) of the total 402 cases tested. The results are graphically represented as in Figure 1.

Table 1: Seropositivity in respect of IgG&/or IgM.

Seropositivity	Toxoplasma	Rubella	CMV	HSV1	HSV2	RPR for Syphilis
	N (%)	N (%)	N (%)	N (%)	N (%)	
IgG	154 (38.3)	275 (68.4)	230 (57.2)	85 (21.1)	47 (11.7)	N (%)
IgM	3 (0.7)	2 (0.5)	7 (1.7)	8 (2)	5 (1.2)	
Both IgG&IgM	3 (0.7)	1 (0.25)	31 (7.7)	2 (0.5)	1 (0.25)	
Total	160 (39.8)	278 (69.1)	268 (66.7)	95 (23.6)	53 (13.2)	

Table 2: TORCH results according to various age groups.

Age group (in years)	No.	Toxoplasma		Rubella		CMV		HSV1		HSV2		RPR
		IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	Reactive
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
≤20	55	1 (1.8)	18 (32.7)	0	41 (74.5)	4 (7.2)	35 (63.6)	3 (5.5)	12 (21.8)	1 (1.8)	7 (12.7)	1 (1.8)
21-25	208	3 (1.4)	71 (34.1)	2 (0.1)	144 (69.2)	29 (13.9)	131 (63)	5 (2.4)	39 (18.7)	2 (0.9)	27 (13)	1 (1.8)
26-30	117	2 (1.7)	58 (49.6)	0	76 (64.9)	4 (3.4)	79 (68.4)	1 (0.8)	29 (24.8)	3 (2.6)	11 (9.4)	0
≥31	22	0	10 (45.5)	1 (4.5)	15 (68.2)	1 (4.5)	16 (72.7)	1 (4.5)	7 (31.8)	0	3 (13.6)	0
Total	402	6 (1.5)	157 (39.05)	3 (0.7)	276 (68.7)	38 (9.5)	261 (64.9)	10 (2.5)	87 (21.6)	6 (1.5)	48 (11.9)	2 (0.5)

Table 3: TORCH results according to birth order.

Birth order	No.	Toxoplasma		Rubella		CMV		HSV1		HSV2		RPR
		IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	Reactive
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
1st	211	2 (0.9)	75 (35.5)	1 (0.5)	137 (64.9)	24 (11.4)	131 (62)	8 (3.8)	44 (20.8)	4 (1.9)	24 (11.4)	2 (0.9)
2nd	152	3 (1.9)	73 (48)	0	112 (73.7)	13 (8.5)	97 (63.8)	2 (1.3)	36 (23.0)	2 (1.3)	20 (13.2)	0
3rd	34	1 (2.9)	15 (44.1)	2 (5.8)	23 (67.6)	1 (2.9)	28 (82.3)	0	7 (20.6)	0	4 (11.8)	0
>3rd	5	0	1 (20)	0	4 (80)	0	4 (80)	0	1 (20)	0	0	0
Total	402	6 (1.5)	157 (39.05)	3 (0.7)	276 (68.7)	38 (9.5)	261 (64.9)	10 (2.5)	87 (21.6)	6 (1.5)	48 (11.9)	2 (0.5)

Table 4 TORCH results according to educational status.

Birth Order	No.	Toxoplasma		Rubella		CMV		HSV1		HSV2		RPR
		IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	Reactive
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Illiterate	11	1 (9)	4 (36.3)	0	8 (72.7)	1 (9)	10 (90.9)	0	4 (36.4)	0	1 (9)	0
Primary	153	0	62 (40.5)	3 (1.9)	110 (71.9)	12 (7.8)	106 (69.3)	5 (3.3)	36 (23.5)	1 (0.6)	23 (15)	1 (0.6)
10 th pass	183	5 (2.7)	83 (45.3)	0	125 (68.3)	22 (12)	113 (61.7)	3 (1.6)	36 (19.7)	3 (1.6)	18 (9.8)	1 (0.5)
Higher	55	0	15 (27.3)	0	33 (60)	3 (5.4)	32 (58.2)	2 (3.6)	11 (20.0)	2 (3.6)	6 (10.9)	0
Total	402	6 (1.5)	157 (39.05)	3 (0.7)	276 (68.7)	38 (9.5)	261 (64.9)	10 (2.5)	87 (21.6)	6 (1.5)	48 (11.9)	2 (0.5)

Table 5: TORCH results according to occupation of spouse.

Occupation	No.	Toxoplasma		Rubella		CMV		HSV1		HSV2		RPR
		IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	Reactive
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Farmer	123	1 (0.8)	56 (45.5)	2 (1.6)	80 (65)	14 (11.4)	77 (62.6)	4 (3.2)	26 (21.1)	1 (0.8)	15 (12.2)	0
Business	102	4 (3.9)	42 (41.2)	0	68 (66.7)	8 (7.8)	69 (67.6)	5 (4.9)	24 (23.5)	1 (0.9)	12 (11.7)	1 (0.9)
Service	60	1 (1.7)	23 (38.3)	0	41 (68.4)	6 (10)	33 (55.0)	0	11 (18.4)	2 (3.3)	6 (10)	0
Others	117	0	46 (39.3)	1 (0.8)	87 (74.3)	10 (8.5)	82 (70)	1 (0.8)	26 (22.3)	2 (1.7)	15 (12.8)	1 (0.8)
Total	402	6 (1.5)	157 (39.05)	3 (0.7)	276 (68.7)	38 (9.5)	261 (64.9)	10 (2.5)	87 (21.6)	6 (1.5)	48 (11.9)	2 (0.5)

Table 6: TORCH results in relation to bad obstetrics history.

BOH	No.	Toxoplasma		Rubella		CMV		HSV1		HSV2		RPR
		IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	Reactive
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Present	23	2 (8.7)	9 (39.1)	0	22 (95.6)	1 (4.3)	20 (87)	0	6 (26.1)	0	4 (17.3)	0
Absent	379	4 (1)	148 (39.0)	3 (0.8)	254 (67)	37 (9)	241 (63.6)	10 (2.6)	81 (21.4)	6 (1.6)	44 (11.6)	2 (0.5)
Total	402	6 (1.5)	157 (39.05)	3 (0.7)	276 (68.7)	38 (9.5)	261 (64.9)	10 (2.5)	87 (21.6)	6 (1.5)	48 (11.9)	2 (0.5)

The mean age of the study subjects was found to be 24.53 ± 3.625 years. Table 2 displays the age group wise distribution of the TORCH seroprevalence. It can be summarized that most of the seroconversions occurred before 20 years of age. The IgM seroconversion for CMV and HSV 2 is highest in the age group above 31 years. From table 3 it is observed that most of the infections are acquired before or during the 1st or 2nd birth orders.

The overall prevalence of TORCH infection seem to be little less, though non-significant, in the ANCs who have higher educational status and whose spouses were working in different services than those engaged in business, agriculture or others a large part of which consist of daily labourers (Table 4 and 5).

Though we have not followed up the cases till their obstetric outcome, the bad obstetric history for previous pregnancies was enquired about. Here it should be noted that the BOH here included only fatal outcomes like abortion and stillbirth, whereas the nonfatal outcomes like low birth weight, mental retardation, sensorineural deafness, congenital anomalies, blindness etc are not reported. Only 23 cases have reported positively and it is worth to be seen that these cases showed higher seroprevalence than others (Table 6).

DISCUSSION

Limited data is available regarding the prevalence of TORCH infections among pregnant women in general and particularly in this geographic area. Most of the studies in India have related the sero-prevalence to presence of bad obstetric history. Only few studies have followed up the cases till the obstetric outcome; rarely any study has continued to follow up to examine the long term complications. As most of the cases remain asymptomatic, determination of maternal antibodies in serum is used to detect infection. To determine the seroprevalence different methods are being used; again many commercial kits use different sources of antigens and the purification method also varies. So it is obvious that there is huge disparity of these data.^{1,6,8,9}

As the congenital complications are mostly associated when mother is infected during pregnancy, rather than before, detection of primary or recent infection is of paramount importance. Though direct methods by detecting microbial components like nucleic acid, antigen etc in patient confirms the diagnosis they are rarely done due to non-availability of standard methods, non-accessibility and cost factors. Detection of specific IgM although is the method used all over the world to detect acute infection, persistence of IgM for long periods poses problems in distinguishing acute from chronic infection, which is of crucial importance in pregnancy. A 4 to 8 fold rise in IgG titre in serum samples taken 2 weeks apart, though indicates a recent infection this is rarely ever practicable as by the time the patient presents in the clinic the antibody titre has already peaked. As the infection

continues the IgG with low avidity matures to high avidity. The low avidity IgG usually persists for near about 100 days. Presence of low avidity IgG indicates recent infection. A positive IgM result should be further tested for IgG avidity to diagnose recent infection.^{4,5,13,14}

In India the sero-prevalence of Toxoplasmosis have been reported to be 5% to 80% in different regions using different types of tests.^{4,15} CMV infection is claimed to be the most common cause of congenital infection in pregnancy and carries a 30-40% risk of vertical transmission. Data from various sources have shown that the seroprevalence of CMV is higher among reproductive age group women of middle or higher education.^{16,17} This is in agreement with our finding. We have found out that 9.5% of the seroconversion occurred during the child bearing age as evidenced by the CMV IgM. Yasodhara et al in their study in south India have recorded the IgM prevalence rates of 13.1%, 6.5% and 5.8%, for Toxoplasma, Rubella and CMV infection.⁸ The IgM seroprevalence of the TORCH infections in our study were found to be low in comparison to other studies carried out in Varanasi in 2012 where Sen et al have reported 19.4% for toxoplasma, 30% for rubella, 34.7% for CMV and 33.5% for HSV 2 infection.⁹ In our study the corresponding figures were 1.4%, 0.7%, 9.4%, and 1.5%. These differences might be attributed to the regional variation, different socioeducational background of the study population and high early seroconversion as indicated by the IgG prevalence.

Out of the total 402 study subjects we got 23 cases who have bad obstetric history. The prevalence of IgG in these subjects is little higher than that observed in the 379 subjects without BOH (Table 6). Turbadkar et al in a study group of 380 pregnant women with BOH had observed that the prevalence of IgM & IgG antibodies was 10.52% and 42.02% for Toxoplasma, 26.8% and 61.3% for Rubella, 8.42% and 91.05% for CMV and 3.6% and 33.58% for HSV 2.⁶ The corresponding figures in our study were depicted in table 6 and comparable in respect of IgG. A high prevalence of TORCH infection is reported in a study carried out in Nepal where the respective rates were 50%, 50%, 8.3% and 33.3%. This study suffers from the fact that it had taken only 12 cases with BOH which is very less to be a representative sample.¹⁸ Also other complications during pregnancy might have contributed to these failed obstetric outcome.

The seroprevalence for Syphilis as per the RPR test results in our study is 0.5%. A seroprevalence of 0.1% is seen in a south Indian study during early part of this decade.¹¹ This is comparable to the findings of Sethi et al who had observed a declining trend of VDRL reactivity from 1.82% in 1996 to 0.84% in 2005 among pregnant women in a 10 year analysis.¹² Our study also corroborates to the low prevalence of syphilis seroreactivity. The declining trend of STDs like syphilis is an indication of effective awareness campaign, awareness and management of these diseases and a result of their

inclusion in national programmes. Also better education and free supply of antibiotics for their treatment may also contribute this trend.

In a long term study spanning from 1989 to 2010 Delaney et al showed that there is a declining trend of HSV 2 infection among pregnant women. He found that the seroprevalence of HSV 2 infection has come down from 30.1% (during 1989-1999) to 16.3% (during 2000 to 2010). By the same time the HSV 1 infection has showed only a marginal difference from 69.1% to 65.5%.¹⁹ The HSV 1 and HSV 2 prevalence of 23.6% and 13.2% respectively in our study might be attributed to regional variation.

CONCLUSION

The prevalence of TORCH infections is very high in this geographic region of western Odisha. Our study shows most of the seroconversion occurs at young ages and particularly in the families who work in agriculture farms. The actual affect these infections make on the obstetrics outcomes are mostly in apparent initially or may be attributed to some other factors due to low awareness of the people regarding these infections. Our study is limited in that there is not enough time for follow up of the cases till their obstetric outcome, which would have given some idea about the actual burden in the community. Though detection of specific IgM antibody is used to differentiate acute infection, persistence of IgM for long periods poses problems in distinguishing acute from chronic infection which is of crucial importance in pregnancy. So other methods like molecular studies including PCR are one option to differentiate active infection. We suggest a more meticulous with a non-constraint time frame for follow up of the patients is needed. Moreover regular health awareness programmes and vaccination against Rubella will help in bringing down the prevalence rate of these infections.

There is considerable confusion as to routine screening of pregnant woman for TORCH infections. Different studies have different data regarding this. But there is agreement in that the parasite is transmitted more frequently during the latter part of gestation but the disease is more severe if infection is acquired during the first and second trimesters and the women who are seropositive before conception, have least risk to their babies, if at all. Although most congenitally infected children are asymptomatic at birth, many will develop some symptoms later in life.

Looking at the large number of antenatal case in the country with their lower socioeconomic status and rural set up, it will be a difficult to screen all cases for TORCH infections. So we suggest a more vigorous IEC drive, identifying the avoidable risk factors precisely and serological screening-in-pregnancy of those exposed to predictors of infection will provide a epidemiologically

sound and financially sustainable measure to curb the TORCH burden.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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