

Review Article

Seroprevalence of TORCH Infections in Women with Spontaneous Abortions and Stillbirths

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Abstract

TORCH infections, which include *Toxoplasma gondii*, Rubella virus, Cytomegalovirus, and Herpes Simplex Virus, are significant contributors to congenital infections worldwide. These infections, transmitted from mother to fetus during pregnancy, can result in a wide range of severe outcomes, including miscarriage, stillbirth, preterm birth, and congenital malformations. Even in cases where the mother is asymptomatic, TORCH infections can lead to lifelong disabilities in the affected newborns, such as hearing and vision loss, neurological deficits, and developmental delays. The urgency of early detection and management in reducing these severe outcomes cannot be overstated. Due to the ability of these pathogens to cross the placental barrier at any stage of gestation, early detection and management are crucial in reducing neonatal morbidity and mortality rates. Studies have shown that the prevalence of TORCH infections varies greatly depending on geographical, cultural, and socioeconomic factors, influencing exposure risks and healthcare access. For instance, undercooked meat consumption, poor sanitation, and low vaccination coverage contribute to higher seropositivity rates in certain regions. Seroprevalence studies indicate that while countries with solid healthcare systems and vaccination programs have managed to control certain infections like Rubella, others, such as Cytomegalovirus and Herpes Simplex Virus, continue to be a significant public health challenge, particularly in developing countries where screening and preventive measures may be limited. The increasing recognition of TORCH infections as a preventable cause of congenital disabilities underscores the need for enhanced

screening, vaccination, and public health awareness efforts, particularly in resource-limited settings. This research highlights the importance of seroprevalence data in guiding public health strategies, emphasizing the need for targeted interventions to prevent the adverse effects of TORCH infections on maternal and child health. The study concludes that comprehensive screening programs, vaccination efforts, and early diagnosis are essential in mitigating the global burden of congenital and perinatal infections caused by TORCH pathogens, and these measures must be implemented proactively.

KEYWORDS: TORCH, Pregnancy, Abortion, Stillbirth IgG, Seroprevalence

INTRODUCTION

Many infections can be transmitted from a mother to a child. These infections of the newborn are mainly acquired in utero (congenital) through trans-placental or ascending infection; during delivery (intrapartum) by contact with infected genital secretions, blood, and feces during delivery; and the neonatal period (postpartum) through breastfeeding, blood transfusion, and nosocomial. These infections are usually associated with complications that become evident either from the maternal or fetal side, during pregnancy, after delivery, or later [1]. Toxoplasma gondii, others (HIV, syphilis, and measles), rubella, cytomegalovirus, and herpes simplex virus 1 and 2 are known as TORCH. These preventable contagious diseases are a public health problem because they cause maternal and neonatal morbidity, disability, and mortality. TORCH can adversely affect a pregnant woman and her fetus. The newborns of pregnant women who are infected with these diseases may have congenital disabilities. Infections that TORCH causes are the major causes of bad obstetric history (BOH) [2]. The interruption and discontinuity of pregnancy can happen due to many factors that include genetic, uterine abnormalities, endocrine and immunological dysfunctions, infectious agents, environmental pollutants, psychogenetic factors, and endometriosis. Infections caused by Toxoplasma gondii, rubella, cytomegalovirus, and herpes simplex are significant causes of pregnancy loss in humans. During pregnancy, if any woman is infected with the above, the risk of a child born with severe congenital disabilities and illness, miscarriage, or stillbirth increases proportionally [3]. TORCH refers to infectious agents that can be transmitted to a child by vertical infection, intrauterine or post-natal. Primary infections associated with some TORCH pathogens during pregnancy, especially in the first trimester, are associated with an increased risk of miscarriage, stillbirth, sterilization, preterm delivery, congenital anomalies, and transient or chronic fatal disease. This risk depends on gestational age and pathogens [4]. Primary infections are more harmful than secondary infections during pregnancy [5]. TORCH syndrome can lead to spontaneous abortion or severe congenital disabilities in the fetus [6]. This infection is responsible for 2-3% of all congenital anomalies. Mental retardation is one of the major complications that will impose a significant economic burden on society and the family [7]. Abortion, defined as a pregnancy loss occurring before 20 weeks of gestation or when the fetus weighs less than 500 g, encompasses unintended, incomplete, and missed abortions. The term "abortion" now refers explicitly to surgical or medical procedures performed for therapeutic or voluntary reasons [8]. Among the various complications affecting the fetus, infections with pathogens from the TORCH group are the most common causes [7].

Primary infections with specific TORCH pathogens during pregnancy, particularly in the first trimester, are associated with an increased risk of miscarriage, stillbirth, premature birth, congenital malformations, and fetal or neonatal transient or chronic diseases [7]. While the diagnosis and management of certain TORCH infections like hepatitis viruses, syphilis, and human immunodeficiency virus are clear and highly effective, others such as TOX, RV, CMV, and HSV often go unnoticed and are challenging to diagnose due to their asymptomatic nature and relatively low virulence, potentially leading to fetal severe consequences [7]. The consequences of TORCH infections during pregnancy can range from intrauterine growth restriction and congenital malformations to fetal death, depending on the gestational age at the time of transplacental infection [9]. While these infections generally cause mild illness in immunocompetent adults, they can have severe complications when acquired during pregnancy, posing risks to the fetus and newborn. Therefore, many countries include screening tests for these infectious organisms as part of routine prenatal care to determine women's immunological status at the beginning of pregnancy [10]. TORCH infections are vertically transmitted and contribute to significant congenital and neonatal morbidity and mortality worldwide [11]. The traditional TORCH infections include TOX, RV, CMV, and HSV. At the same time, the "other" category encompasses various communicable pathogens like hepatitis B and C, HIV, syphilis, Chagas disease, Zika virus, varicella, and parvovirus B19 [12]. The clinical outcomes of TORCH infections commonly include low birth weight, preterm birth, stillbirth, hearing and vision loss, and long-term neurological and developmental sequelae that can significantly impact affected children throughout their lives [12]. Among these infections, TORCH infections stand out due to their profound impact on fetal development and pregnancy outcomes. Since TORCH pathogens can cross the placental barrier, early detection and intervention are essential to minimize adverse outcomes [9]. This is particularly important in low-income countries where access to prenatal care and screening tests may be limited, leading to higher rates of undiagnosed congenital infections. The global burden of TORCH infections varies widely depending on geographic location, healthcare infrastructure, and public health policies, particularly regarding prenatal screening. In countries with well-established prenatal screening programs, congenital infections like rubella have drastically decreased due to widespread vaccination [10]. However, in many developing nations, vaccination rates remain low, and congenital rubella syndrome (CRS) continues to pose a significant threat to maternal and child health [12]. For example, studies in India and other South Asian countries reveal persistent cases of CRS, underscoring the need for improved vaccination coverage [13]. *Toxoplasma gondii*, another

significant TORCH pathogen, exhibits varying prevalence worldwide and is influenced by dietary habits, sanitation standards, and cultural practices. In regions where consumption of undercooked meat and exposure to contaminated water are every day, higher rates of Toxoplasma seropositivity are observed [14]. In contrast, countries with stringent food safety regulations and better hygiene practices report lower infection rates [13]. One of the most significant challenges in managing TORCH infections is their often asymptomatic presentation in pregnant women, making early detection difficult [7]. While certain infections, like HIV and hepatitis viruses, are typically diagnosed through routine blood tests and managed effectively, others, such as CMV and HSV, frequently go unnoticed until they result in fetal complications [15]. For instance, congenital CMV infection is the leading non-genetic cause of sensorineural hearing loss in children, yet it often remains undiagnosed until after birth. The need for comprehensive screening and timely intervention cannot be overstated. Studies in various regions have shown that early detection of TORCH infections can significantly reduce the rates of fetal complications and neonatal morbidity [16]. This is especially true for CMV, where antiviral treatments administered during pregnancy have improved outcomes for both mothers and their fetuses [17]. Vaccination is crucial in reducing the incidence of certain TORCH infections, particularly rubella. In countries where rubella vaccination is part of routine immunization programs, the incidence of CRS has decreased dramatically [12]. However, in countries with inadequate vaccination coverage, rubella remains a significant public health issue [18]. Public health campaigns that promote vaccination and educate women of reproductive age about the risks of TORCH infections are essential in reducing the global burden of congenital infections.

OBJECTIVE

This study compares the seroprevalence rates of TORCH infections (Toxoplasma gondii, Rubella virus, Cytomegalovirus, and Herpes Simplex Virus) across various studies in different geographical areas.

RATIONALE

TORCH infections, comprising Toxoplasma gondii, Rubella virus, Cytomegalovirus, and Herpes Simplex Virus, continue to threaten maternal and neonatal health worldwide significantly. These pathogens are notorious for their ability to cross the placental barrier and infect the developing fetus, leading to severe outcomes such as miscarriage, stillbirth, congenital anomalies, and long-term disabilities in newborns. The fact that many of these infections are asymptomatic in pregnant women, combined with the severe risks they present to the fetus, underlines the importance of early screening and

intervention during pregnancy. This early detection empowers healthcare professionals and policymakers to take proactive measures, potentially saving lives and reducing the burden of these infections [7]. The vertical transmission of these infections, which contributes to significant neonatal morbidity and mortality, further emphasizes the critical need for preventive strategies [11]. Seroprevalence studies conducted in various regions show notable differences in the rates of TORCH infections, reflecting the influence of diverse factors such as geographical location, dietary habits, sanitation practices, and access to healthcare services. For instance, areas with higher rates of *Toxoplasma gondii* infections are often associated with poor hygiene, consumption of undercooked meat, and close contact with cats. In comparison, regions with strong vaccination programs have significantly lower rates of Rubella infections [19]. These variations highlight the complex interplay between environmental, cultural, and healthcare factors in determining infection prevalence. The success of vaccination programs, especially for Rubella, in reducing the incidence of congenital rubella syndrome in countries with high immunization rates underscores the potential of tailored prevention strategies. However, the ongoing burden of other TORCH infections like Cytomegalovirus and Herpes Simplex Virus, which lack routine vaccines or are often underdiagnosed, presents a continued challenge, particularly in developing regions [12]. Cytomegalovirus remains a leading cause of congenital infections, responsible for neurodevelopmental disabilities in children, yet it is frequently missed in routine screening due to its often asymptomatic nature in mothers [10]. This study's rationale lies in addressing these gaps through a comparative analysis of multiple studies' seroprevalence rates and public health measures. By examining data from different geographical areas, the study seeks to provide insights into how variations in healthcare infrastructure, public health policies, and cultural practices affect the spread of TORCH infections. Understanding these differences is essential for tailoring prevention strategies that can effectively reduce the global burden of these infections. Moreover, raising awareness about the importance of prenatal screening, improving access to healthcare, and reinforcing vaccination efforts in resource-limited regions are pivotal in mitigating the effects of TORCH infections on maternal and child health [16].

DISCUSSION

TORCH infections are commonly recognized as major causes of congenital infections, which can lead to adverse outcomes such as embryo loss, stillbirth, and congenital disabilities, even when initially asymptomatic. The microbial agents of TORCH infections can cross the placenta and infect the fetus during any trimester of pregnancy. Therefore, it is crucial to perform screening tests for pregnant women to detect these infections early, as this can help reduce neonatal mortality and morbidity. TORCH tests typically screen for immunoglobulin G (IgG) and immunoglobulin M (IgM), where IgG antibodies indicate past infections and IgM antibodies suggest present or acute infections. For *Toxoplasma gondii*, studies have shown varying rates of IgM seropositivity: 57.3% by Alajeel et al. (2022) in Iraq [20], 45% by Kakayi et al. (2021) in Iraq [21], 21% by Ashok (2022) in India [19], 11.9% by Hazazi et al. (2023) in Jizan [14], 11.6% by Lamichhane et al. (2016) in Nepal [22], and 1.2% by Rasti et al. (2016) in Iran [13]. The differences in IgM prevalence may be attributed to geographical variations, dietary habits, sanitation standards, hygiene practices, and water contamination. The seropositivity rates for IgG antibodies against *Toxoplasma gondii* also varied: 54% by Alajeel et al. (2022) in Iraq [20], 40% by Hazazi et al. (2023) in Jizan [14], 30% by AL-Azzawy et al. (2022) in Iraq [23], 27.2% by Rasti et al. (2016) in Iran [13], 20% by Shah et al. (2015) in Pakistan [24], 21% by Acharya et al. (2014) in Nepal [18], 17.7% by Rasti et al. (2016) in Iran [13]. Regarding Rubella virus, IgM seropositivity rates were found to be 73% by Alajeel et al. (2022) in Iraq [20], 18.3% by Kakayi et al. (2021) in Iraq [21], 10.9% by Shah et al. (2015) in Pakistan [24], 11.7% by Ashok (2022) in India [19], 1.2% by Rasti et al. (2016) in Iran [13]. IgG seropositivity rates were notably high, reaching 100% by Shah et al. (2015) in Pakistan [24], 86% by Acharya et al. (2014) in Nepal [18], 75% by Rasti et al. (2016) in Iran [13], 43.6% by Lamichhane et al. (2016) in Nepal [22], 34% by Alajeel et al. (2022) in Iraq [20], 24.9% by Hazazi et al. (2023) in Jizan [14], 20% by LA-Azzawy et al. (2022) in Iraq [23]. The variation in IgG prevalence could be attributed to successful national vaccination programs in certain countries. Rubella is typically a mild viral infection in children but can cause serious complications if contracted during early pregnancy, leading to congenital rubella syndrome (CRS). The availability of vaccines has significantly reduced CRS in developed countries, although it remains a significant issue in developing regions. For Cytomegalovirus (CMV), IgM seropositivity was observed as follows: 69% by Shah et al. (2015) in Pakistan [24], 19.4% by Lamichhane et al. (2016) in Nepal [22], 25.9% by Rasti et al. (2016) in Iran [13], 21.6% by Kakayi et al. (2021) in Iraq [21], and 21.7% by Ashok (2022) in India [19]. IgG seropositivity rates were 100% by

Shah et al. (2015) in Pakistan [24], 87% by Rasti et al. (2016) in Iran [13], 66.7% by Ashok (2022) in India [19], 64% by Acharya et al. (2014) in Nepal [18], 60% by Alajeel et al. (2022) in Iraq [20], 41.7% by Lamichhane et al. (2016) in Nepal [22], 26% by AL-Azzawy et al. (2022) in Iraq [23], 28.9% by Hazazi et al. (2023) in Jizan [14]. CMV infection in pregnant women is a leading cause of congenital infections and can result in fetal loss and long-term disabilities in affected children. For Herpes Simplex Virus (HSV), the IgM seropositivity rates were 54.5% by Alajeel et al. (2022) in Iraq [20], 31% by Lamichhane et al. (2016) in Nepal [22], and 0.5% by Hazazi et al. (2023) in Jizan [14]. IgG seropositivity rates were 72.8% by Acharya et al. (2014) in Nepal [18], 53% by Alajeel et al. (2022) in Iraq [20], 54.3% by Lamichhane et al. (2016) in Nepal [22], 24% by Al-Azzawy et al. (2022) in Iraq [23], 11.7% by Ashok (2022) in India [19], 0.9% by Hazazi et al. (2023) in Jizan [14]. The variation in seroprevalence rates observed across different studies highlights the impact of geographical, cultural, and healthcare differences on the spread of TORCH infections. For instance, higher seropositivity rates in *Toxoplasma gondii* in certain regions may be linked to dietary habits involving undercooked meat or unwashed vegetables and contact cats. Meanwhile, the low prevalence of Rubella in countries with strong vaccination programs underscores the importance of immunization in controlling congenital infections. Additionally, the consistently high rates of CMV and HSV seropositivity suggest a need for enhanced screening and preventive strategies, especially in regions with inadequate healthcare access.

CONCLUSION

Screening for TORCH infections among women of reproductive age, particularly during early pregnancy, is crucial. Early diagnosis and timely intervention can help effectively manage these cases and reduce the risks of morbidity and mortality. Primary infections with TORCH agents during pregnancy can lead to miscarriages, congenital anomalies, neonatal death, and stillbirth. Preventing these outcomes requires raising awareness and implementing robust screening programs. To prevent congenital rubella syndrome, it is necessary to introduce vaccination and health awareness programs, particularly in regions with low immunization rates. Additionally, seroprevalence studies provide essential data that can guide public health interventions and policy decisions to reduce the impact of TORCH infections on maternal and child health.

RECOMMENDATIONS

1. **Implement Routine Screening:** Introduce routine TORCH infection screenings in all pregnant women, particularly in the first trimester. Early detection allows for timely interventions that can prevent adverse pregnancy outcomes such as miscarriages, stillbirths, and congenital disabilities.
2. **Enhance Public Awareness and Education:** Develop public health campaigns to educate women of reproductive age about TORCH infections, modes of transmission, potential risks during pregnancy, and the importance of early screening and follow-up.
3. **Expand Vaccination Programs:** Strengthen national vaccination programs against Rubella, particularly in countries with low immunization coverage. Ensure that women of childbearing age are vaccinated before pregnancy to reduce the risk of congenital rubella syndrome.
4. **Hygiene and Sanitation Practices:** Promote good hygiene and sanitation practices, including safe food handling, proper washing of fruits and vegetables, and avoiding contact with potentially contaminated sources to reduce the risk of infections such as *Toxoplasma gondii*.
5. **Support Further Research:** Encourage further research on TORCH infections, including studies on the effectiveness of preventive strategies, the impact of infections on pregnancy outcomes, and the development of new diagnostic and treatment options.

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