



## EPIDEMIOLOGY, CLINICAL FEATURES, TREATMENT, AND PREVENTION OF «TORCH INFECTIONS»: A LITERATURE REVIEW.

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<p><b>Received:</b> November 11<sup>h</sup> 2025 <b>Accepted:</b> December 11<sup>th</sup> 2025</p>	<p>This article presents information on the current relevance of TORCH infections, their prevalence among the population, and routes of transmission. The impact of the disease on the health of the mother and fetus during pregnancy, as well as its consequences, has been studied. The infection is mainly transmitted through sexual contact and has an adverse effect on the fetus during pregnancy. It occurs with equal frequency among men and women. The incidence is more commonly observed beginning from puberty. The incubation period ranges from 5 to 23 days. The first signs of infection may appear during the intrauterine period of pregnancy, at birth, in infancy, or even years later.</p>

**Keywords:** TORCH infection, toxoplasmosis, hepatitis B, syphilis, chlamydiosis (chlamydia infection), rubella, cytomegalovirus, herpes, prenatal, transplacental, PCR, CT, MRI, IgM, IgG, ganciclovir, sulfadiazine, folic acid.

### INTRODUCTION

TORCH is an acronym formed from the initial letters of the most common infections that are extremely dangerous for the fetus. TORCH infection refers to a group of infections that can affect individuals of any age and sex; however, they are particularly relevant for women preparing for pregnancy, pregnant women, fetuses, and newborns. These infections primarily occur during pregnancy and have a significant impact on newborns. They produce similar pathological manifestations in both men and women. Transmission of these infections may occur through sexual contact, airborne droplets, breastfeeding, exposure to infections in the birth canal, as well as through contact with cat fur and feces. The infection can be transmitted to the fetus via the placenta, negatively affecting the proper development of embryonic organs. An infected individual may transmit the pathogen to others through saliva and mucus when coughing or sneezing. Early diagnosis, treatment, and preventive measures for all diseases included in the TORCH group are considered effective strategies for disease prevention [1].

TORCH represents a group of infections which, if acquired during pregnancy—especially before 20 weeks of gestation—may result in severe congenital anomalies or serious fetal conditions. Each letter denotes a specific disease:

*T (Toxoplasmosis)* According to estimates, the global prevalence of toxoplasmosis is approximately 30% [2]. Although nearly half of infections are subclinical, severe cases may lead to immunodeficiency or congenital disability. Worldwide, toxoplasmosis is responsible for approximately 1.2 million cases of disability [3]. The disease can be transmitted to humans from domestic animals, particularly cats. The pathogen is usually shed into the environment through cat feces, where it can persist for months. This contributes to infection in other animals and birds. The parasite localizes in their muscle tissue and is subsequently transmitted to humans through consumption of meat. Adequate cooking destroys *Toxoplasma* and prevents infection; however, insufficiently cooked or undercooked meat may retain the parasite and cause disease [4].

In addition, transmission may occur through contaminated hands, unsafe water, and poor personal hygiene. Toxoplasmosis is particularly dangerous for the fetus. It often remains asymptomatic but may cause miscarriage in early pregnancy. If a woman is infected with *Toxoplasma* for the first time during pregnancy, fetal death or severe congenital disease may occur, including damage to the liver, spleen, lymph nodes, and central nervous system, potentially resulting in disability.

*O (Other infections)* This category includes hepatitis B, syphilis, chlamydia, and other viral and



bacterial infections. These infections are often asymptomatic but pose a serious threat to the fetus. For example, chlamydial infection in pregnant women may result in preterm birth [11].

*R (Rubella)* Rubella is transmitted from person to person, primarily via airborne droplets. Its main clinical manifestations include fine pink maculopapular rashes covering the body and an increase in body temperature up to 38°C, more commonly observed in adults. Rubella is most frequently encountered during childhood and is therefore considered a classic "**childhood infection.**" In children, the disease is usually mild, whereas in adults it tends to be more severe. Rubella poses a significant risk to the fetus, especially during the first trimester of pregnancy. It can damage neural tissue, ocular structures, and the fetal heart, and may even result in fetal death. Therefore, assessing immunity to rubella during pregnancy planning is essential [12].

*C (Cytomegalovirus infection)* Most individuals infected with *cytomegalovirus* (CMV) are unaware of their infection. CMV was identified in the twentieth century. Transmission may occur through sexual contact, blood, saliva, and breastfeeding. Currently, approximately 80% of women of reproductive age are carriers of this infection. In most cases, CMV remains in a latent (dormant) state. Occasionally, it may present with symptoms resembling a common cold; however, clinical manifestations are usually absent. The risk of reactivation and progression to an acute form arises primarily during periods of severe immunosuppression. The greatest risk to the fetus occurs when a woman is infected with CMV for the first time, particularly during the first trimester of pregnancy. Possible outcomes include miscarriage, preterm birth, developmental brain abnormalities, hydrocephalus (accumulation of cerebrospinal fluid), jaundice, hepatosplenomegaly, congenital heart defects, and other congenital deformities [4].

*H (Herpes simplex virus types I and II)* Several types of herpes viruses are currently known, with herpes simplex virus type I (HSV-1) and type II (HSV-2) being the most common. HSV-1 typically presents as "cold sores" on the lips, face, and oral mucosa, whereas HSV-2 causes genital herpes with characteristic lesions on the genital organs. Herpes viruses may be transmitted through various routes, including direct contact and airborne droplets; however, sexual transmission is considered the primary route. According to some data, approximately 90% of the global population is infected with herpes virus. The virus may remain latent for years and becomes active primarily during periods of immune suppression. Primary herpes

infection during pregnancy is extremely dangerous for the fetus. In early pregnancy, infection may result in spontaneous abortion. In the second half of pregnancy, it may cause severe congenital anomalies such as microcephaly, retinal pathology, and congenital heart defects. Once acquired, the virus persists in the body for life [14].

Transmission of pathogens may occur prenatally via the transplacental route. Perinatal transmission may occur through blood or vaginal secretions. Approximately 2–3% of all congenital anomalies are associated with perinatal infections [13]. Transplacental transmission of *Toxoplasma* leads to congenital toxoplasmosis, which is most commonly observed during the third trimester of pregnancy. However, the earlier the infection occurs, the more severe the congenital defects [5].

The incubation period of the disease ranges from 5 to 23 days. Initial signs of infection may be detected during intrauterine development, at birth, during infancy, or even years later.

A key characteristic of TORCH infections is their low-symptomatic or asymptomatic course, during which they still exert a negative impact on fetal development and pregnancy outcomes. The risk of fetal damage due to primary maternal **cytomegalovirus** infection is approximately 40%. For toxoplasmosis, the risk is 15–25% during the first half of pregnancy and 60–70% during the second half. **Fetal infection** with rubella occurs with nearly 100% probability if maternal infection takes place during the first trimester. **Herpes** virus transmission to the fetus occurs mainly during childbirth through contact with infected mucous membranes, which almost always leads to severe consequences for the newborn. The transmission rate of CMV and toxoplasmosis from mothers to infants ranges from 2 to 10 cases per 1,000 births [7].

#### Laboratory Diagnosis of TORCH Infections

**TORCH** infections are diagnosed using blood tests, PCR (polymerase chain reaction), and rapid viral tests (express tests). PCR testing is performed by detecting the genetic material of the virus in a fluid sample obtained from the patient. Samples collected for testing include saliva, nasal mucosal swabs, blood, urine, amniotic fluid, and swabs taken from skin rashes or lesions. During pregnancy, imaging studies such as computed tomography (CT) or magnetic resonance imaging (MRI) may be used to identify complications or associated effects of TORCH infections.

For blood analysis, venous blood is collected from the pregnant woman to determine the presence of antibodies against TORCH infections, specifically immunoglobulins IgM and IgG [7]. Diagnostic testing



should be conducted 1–2 months prior to a planned pregnancy or within the first two weeks of pregnancy. If infection has occurred, IgM antibodies are detected in the serum, reaching their peak concentration by the end of the first month following infection. When testing is performed 2–3 months later, immunoglobulin levels decline sharply, making detection nearly impossible.

**The purpose of diagnostic testing** is to identify antibodies against pathogens responsible for

intrauterine infections. **Antibodies** are protein compounds produced when harmful viruses or bacteria enter the body. Blood tests identify two types of immunoglobulins: IgM and IgG. **IgM antibodies** indicate an acute stage of infection, whereas **IgG antibodies** indicate previous exposure to the infection and the development of immunity.

**Interpretation of TORCH Infection Test Results**

<b>IgG</b>	<b>IgM</b>	<b>Interpretation</b>
<b>+</b>	<b>-</b>	The organism has been previously infected and has developed immunity. There is no risk to the fetus.
<b>-</b>	<b>+</b>	The infection has been acquired recently, and immunity has not yet been established.
<b>+</b>	<b>+</b>	The disease is in the acute phase, and the risk of transmission to the fetus is very high.
<b>-</b>	<b>-</b>	There is no immunity, and there is a risk of primary infection during pregnancy.

Based on the test results, the physician assesses the likelihood of disease development in both the fetus and the mother. When necessary, treatment with antimicrobial and antiviral medications is prescribed.

Vertical transmission of the parasite (mother → fetus) occurs during the acute phase of infection. The risk of transmission increases significantly as pregnancy progresses. Below is the rate of maternal–fetal transmission according to gestational age [13]:

- Up to 12 weeks → **5%**
- 12–16 weeks → **15%**
- 17–23 weeks → **25%**
- From 24 weeks → **60%**

The most common clinical manifestation is ocular involvement. In some cases, when the fetus is infected during the first trimester, severe neurological damage may also be observed [13].

Gestational period	Vertical transmission	Fetal involvement	Clinical manifestations
Up to 14 weeks	10%	60%	Ocular and cerebral involvement; <i>may be severe</i>
14–28 weeks	15–55%	25%	Predominantly ocular involvement; <i>usually mild</i>
After 28 weeks	55–80%	15%	Cerebral involvement is very rare

**TREATMENT**

There are no vaccines available for the prevention of most TORCH infections. Because TORCH infections pose a serious threat to fetal life, treatment is carried out exclusively under inpatient (hospital) conditions. In certain cases, ganciclovir is administered [9].

Congenital rubella, however, is one of the most common neonatal diseases that can be prevented through vaccination. A single dose of the rubella vaccine provides lifelong immunity in the mother [10].

Patients with cytomegalovirus infection should be treated with ganciclovir or valganciclovir. The primary

objective of this therapy is the preservation of hearing function. In newborns with cytomegalovirus infection who exhibit central nervous system (CNS) involvement, oral valganciclovir therapy for six months (16 mg/kg per dose, administered orally twice daily) has demonstrated favorable outcomes within two years. The dosage should be adjusted as the child grows [11].

**CONCLUSION**

In conclusion, TORCH infections constitute a group of diseases that pose a serious risk to both the mother and the fetus during pregnancy and include syphilis, toxoplasmosis, rubella, cytomegalovirus



infection, herpes, and other infections. These infections may be transmitted through sexual contact, airborne droplets, breastfeeding from mother to child, during the delivery process, as well as through contact with cat fur and feces. The most dangerous characteristic of these infections is that clinical symptoms may appear in the maternal organism only after pregnancy; if timely diagnosis is not performed, this may result in congenital anomalies in the newborn, intrauterine growth restriction, miscarriage, or even fetal death. These infections primarily affect the nervous system and are a major cause of congenital disorders and disability.

For diagnostic purposes, samples such as saliva, nasal mucous secretions, blood, urine, amniotic fluid, and swabs from skin rashes or lesions are collected. Serological tests, polymerase chain reaction (PCR), and ultrasonography are used for analysis. Preventive measures primarily include maintaining safe sexual practices and adhering to hygiene rules, as many pathogens are transmitted mainly through sexual contact and poor hygiene. TORCH infections are widespread worldwide and represent a significant threat to maternal and child health. In many countries, the lack of established screening systems for early diagnosis of TORCH infections creates serious challenges in protecting the health of mothers and newborns.

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