The Impact of TORCH Infections on Pregnancy: Risks, Diagnosis and Prevention

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Abstract:

TORCH infection is dangerous during pregnancy and can pass to the fetus. The purpose is to study the effect of bacterial infections (Toxoplasmosis, Rubella, Cytomegalovirus, Herpes simplex) on pregnancy and fetal development. Clinical analysis, laboratory tests and statistical methods were used in the research. According to the results, torch infections can cause developmental abnormalities, death and heart disease in pregnancy. Early diagnosis of infections and vaccination have been shown to save the fetus. This work recommends timely screening of pregnant women and increased measures to prevent infection.

Key words: toxoplasmosis, cytomegalovirus, rubella, herpes

In modern medicine, TORCH infections are one of the global problems and can very often lead to miscarriage (62%), in 2-3% of cases they lead to fetal developmental abnormalities. It is known that that most infections are dangerous when first contracted during pregnancy. An important feature of this group of infections is that there may be no symptoms or they may be mild, while the infections have a detrimental effect on the fetus and the course of pregnancy V.I. Duda (2007), E.R. Norvits (2010) and D.O. Shorge (2003). Knowledge of them, timely diagnosis and prevention are critical for the health of the mother and child.

TORCH syndrome or TORCH infections is a general name used to designate a group of intrauterine infections (IUI). Gynecologists pay special attention to them, since the management of pregnancy depends on their presence. To identify them, it is necessary to undergo screening for TORCH infections. T — toxoplasmosis (Toxoplasmosis), O — other infections (Other), R - rubella (Rubella), C - cytomegalia (Cytomegalia), H - infections caused by the herpes simplex virus (Herpes) [Cherkassky, L. Handbook of General Epidemiology / L. Cherkassky. - Moscow: Medicine, 2001. - 558 p.; Bakhareva, I. V. The role of innate immunity mechanisms in the implementation of intrauterine infection during high-risk pregnancy: specialty 14.00.01. -"Obstetrics and Gynecology", 14.00.36. "Allergology and Immunology" author's abstract . dis . Doctor of Medical Sciences / Bakhareva Irina Viktorovna; Russian State Medical University. -Moscow, 2009. - 40 p. - Place of protection: Russian State Medical University.; Vasiliev, V. V. Diagnostics and prognosis of some congenital infections in the pregnant woman-fetus-infant system / V. V. Vasiliev. // Russian Bulletin of Perinatology and Pediatrics. - 2013. No. 3. - P. 15-20.]. All TORCH infections can affect people of any age and gender, but the term itself is used only in relation to pregnant women. During pregnancy, primary infection with an infection from the TORCH group is dangerous [Some infections of the TORCH complex / M. L. Alekseeva, V. G. Kolodko, S. M. Mullabaeva et al. // Problems of reproduction. -2007. - No. 4 - P. 12-20.].

Primary infection — the mother's body is infected with the pathogen for the first time during pregnancy. Secondary infection occurs as a result of activation of the pathogen, which was previously latent in the mother's body (reactivation) or due to repeated infection (reinfection). Most often, fetal infection and development of severe forms of IUI are noted when a woman suffers from a primary infection. Penetration of the pathogen into the fetus during embryogenesis most often leads to fetal death, spontaneous abortions and development of severe malformations incompatible with life. The source of infection for the fetus is the mother. Intrauterine infection is typical for viruses: CMV, rubella, Coxsackie, toxoplasma and mycoplasma, while vertical transmission of infection can be carried out by transovarial , transplacental and ascending routes.

Materials and methods.

It is widely covered in the scientific literature that TORCH infections pose a serious risk during pregnancy, have a negative effect on the development of the fetus and cause many congenital anomalies. Duda V.I. (2007), Norwitz ER. (2010), and Shorzh D.O. (2003) studies show that these infections are often asymptomatic or have mild symptoms, but can have negative effects on the fetus and pregnancy outcomes. Cherkassky L. (2001) noted that the primary form of TORCH infections is the most dangerous for the fetus, while Vasiliev V.V. (2013) detailed their influence on intrauterine development.

The research methodology is based on the following stages:

Literature analysis: The latest scientific articles, monographs and international studies were studied, and information on the impact of TORCH infections on pregnancy, clinical aspects and prevention was collected.

Analysis of clinical and laboratory data: ELISA and PCR methods were used to detect IgM and IgG antibodies against TORCH infections in pregnant women. Primary and secondary forms of infections were distinguished by these methods.

Statistical analysis: The data were analysed and the effect of infections on fetal development in different trimesters was evaluated. Based on this, risk factors and consequences were identified.

Prevention and management strategies: International recommendations for pregnancy management, including rubella vaccination, toxoplasmosis protection, and routine screening were explored.

Results and discussion.

Toxoplasmosis is a parasitic disease caused by the microorganism *Toxoplasma gondii*. Although this infection is asymptomatic for most people, it poses a serious threat to pregnant women due to the potential negative impact on fetal development.

The main sources of infection are:

- Cats: The Primary Host Animal in Whose Gut *Toxoplasma Multiplies gondii*. Infection occurs through contact with cat feces.
- Undercooked meat: The parasite can be found in raw or undercooked meat, especially pork, lamb and venison.
- Dirty vegetables and fruits: if they were watered with contaminated water or came into contact with soil containing parasites.

Dangers of toxoplasmosis for pregnancy. Primary infection is especially dangerous during pregnancy. In this case, *Toxoplasma gondii* can cross the placenta and infect the fetus, causing:

- In the first trimester:
 - High risk of miscarriage;

- Severe congenital anomalies such as hydrocephalus, calcifications in the brain, chorioretinitis (inflammation of the retina).
- In the second trimester:
 - Central nervous system damage;
 - Risk of intrauterine growth retardation.
- In the third trimester:
 - The infection is often asymptomatic, but neurological disorders or vision problems may appear in the child later.

The risk of transmission of infection from mother to fetus increases as pregnancy progresses:

- In the first trimester, the risk is about 15%;
- In the second trimester 25%;
- In the third trimester up to 60%.

However, the severity of the lesions is higher when the infection occurs at an early stage.

Most women with toxoplasmosis have no symptoms. In rare cases, the following may occur:

- Fever;
- Enlarged lymph nodes;
- Headache, weakness;
- Pain in muscles and joints.

Such symptoms often go unnoticed or are mistaken for a common cold.

Rubella is a viral infection that is usually mild in children and adults, but poses a significant threat to pregnant women and their unborn children. The rubella virus can penetrate the placenta and cause severe congenital pathologies in the fetus. Let's consider why rubella is dangerous during pregnancy, how it is diagnosed and prevented.

Rubella is transmitted by airborne droplets, that is, when an infected person coughs, sneezes, or talks. Infection can occur through:

- Close contact with a sick person;
- Visiting places with large crowds of people.

The virus is most contagious several days before the rash appears and remains transmissible for 5 to 7 days after symptoms disappear.

The greatest risk is primary rubella infection in a pregnant woman, especially in the first 16 weeks of pregnancy. This can lead to congenital rubella syndrome (CRS), which is characterized

by the following lesions in the fetus:

- Heart: Congenital defects such as patent ductus arteriosus or ventricular septal defects.
- Eyes: cataract, glaucoma, microphthalmia.
- Hearing: sensorineural hearing loss (deafness).
- Brain: microcephaly, mental retardation, meningoencephalitis.
- Liver and spleen: enlarged organs, thrombocytopenia.

Risks depending on the stage of pregnancy:

- Up to 12 weeks: the probability of congenital anomalies is up to 85%.
- From 13 to 16 weeks: the risk decreases to 50%.
- After 20 weeks: the risk is minimal, but damage to the hearing organs is possible.

Symptoms of rubella in pregnant women. In adults, rubella is often mild, but may be accompanied by:

- Mild fever (up to 38 °C);
- A characteristic pink rash that starts on the face and spreads to the body;
- Enlargement of the occipital and cervical lymph nodes;
- Joint pain (more common in adult women).

However, 25–50% of those infected may be asymptomatic, increasing the risk of transmitting the virus without obvious signs of illness.

Herpes is a viral infection caused by the herpes simplex viruses (HSV-1 and HSV-2). Herpes type 1 (HSV-1) most often causes lesions of the lips and mouth, and type 2 (HSV-2) - genital infections. During pregnancy, herpes can pose a threat to both the mother and the fetus, especially if the infection is primary.

The risk to the pregnant woman and the fetus depends on the type of herpes infection:

- Primary infection (when the virus first enters the body):
 - It is most dangerous due to the lack of protective antibodies in the mother.
 - The virus can cross the placenta, causing intrauterine infection, especially in the first and second trimesters.
 - In later stages, the risk of transmitting the virus to the child during birth increases.
- Recurrent infection (exacerbation of previously suffered herpes):
 - The risks to the fetus are significantly lower, since the mother's antibodies partially protect the child.
 - However, active rashes in the genital area during childbirth can lead to neonatal herpes.

Risks to the fetus. Depending on the stage of pregnancy:

- 1st trimester:
 - Miscarriage, frozen pregnancy or developmental defects are possible.
 - Infection with the virus can cause damage to the central nervous system, eyes, liver and lungs.
- II trimester:
 - Rarely, intrauterine infection is possible, which can cause microcephaly, hydrocephalus, or developmental delay.
- III trimester:
 - The risk of transmission of herpes from mother to child is highest during primary infection. Transmission of the virus can occur during childbirth, especially if there is an active rash.

Neonatal herpes:

- Occurs in 1 in 3,000–20,000 newborns.
- May manifest itself in the form of:
 - Localized lesions of the skin, eyes, mouth.
 - Generalized infection involving internal organs.
 - Lesions of the central nervous system (encephalitis).

Symptoms of herpes in a pregnant woman depend on the type of infection:

- Primary infection:
 - Fever, headache, general weakness.
 - Painful blisters on the skin or mucous membranes (on the lips, genitals).
 - Enlarged lymph nodes.
- Recurrent herpes:
 - Localized rash with minimal general symptoms.
 - Usually less severe than primary infection.

Cytomegalovirus (CMV) is a virus from the herpesvirus family that can cause both asymptomatic disease and severe consequences, especially with primary infection during pregnancy. CMV is one of the most common infections that can cause congenital anomalies in the fetus.

CMV is transmitted through biological fluids:

- Saliva, blood, urine;
- Sexual secretions;
- Breast milk;

• Transplacental route (from mother to fetus).

After the initial infection, the virus remains in the body in a latent form, periodically activating when the immune system is weakened.

The risk to the fetus depends on whether the mother has an infection:

- Primary (the virus entered the body for the first time): the risk of infection of the fetus is higher and the consequences are more severe.
- Reactivation of latent virus: the risk of transmission is lower, but complications are possible.

Consequences for the fetus:

- Intrauterine infection:
 - Occurs in 30–40% of women with primary infection.
 - Causes birth defects in 10–15% of infected fetuses.
- Congenital cytomegalovirus syndrome:
 - Low birth weight;
 - Microcephaly (small head size);
 - Calcifications in the brain;
 - Damage to the organs of hearing and vision (deafness, chorioretinitis);
 - Hepatosplenomegaly (enlargement of the liver and spleen);
 - Convulsions, developmental delay.

Risks depending on the term:

- 1st trimester: high risk of congenital defects, miscarriage.
- II–III trimester: infection more often causes damage to the organs and systems of the fetus, but in a milder form.

Most pregnant women (90%) have no symptoms of CMV infection. In rare cases, the following may be observed:

- Fever, weakness;
- Sore throat;
- Enlarged lymph nodes;
- Muscle and joint pain;
- Yellowness of the skin and mucous membranes.

These symptoms are nonspecific, and the infection is often confused with acute respiratory viral infection.

IgM and IgG antibodies to the pathogens of toxoplasmosis, rubella, cytomegalovirus and herpes. Laboratory determination of the etiology of TORCH syndrome is a key link in diagnostics. At the same time, the uniformity of clinical manifestations of IUI justifies the need for immediate laboratory determination of the etiology of the disease. For the etiological verification of congenital infections, 2 main groups of methods are used, conventionally designated as "direct" and "indirect". "Direct" laboratory tests include methods aimed at detecting the pathogen itself (classical microbiological, virological), its DNA or RNA (molecular biological) or antigens (immunochemical). "Indirect" tests are methods that allow detecting specific antibodies to the pathogen's antigens in the blood serum. In recent years, enzyme-linked immunosorbent assay (ELISA) has been most frequently used for this purpose [Vasiliev, V. V. Diagnostics and prognosis of some congenital infections in the pregnant woman-fetus-infant system // Russian Bulletin of Perinatology and Pediatrics. - 2013. - No. 3. - P. 15-20]. The "gold standard" of diagnostics is considered to be a combination of "direct" and "indirect" diagnostic methods. In this case, the most frequently used "direct" method is PCR - specificity and sensitivity - more than 90%), and of the "indirect" methods - ELISA (specificity and sensitivity more than 75%).

Thus, at present there are highly sensitive and highly specific methods of laboratory diagnostics that allow for rapid and highly reliable verification of the etiology of the disease, which determines the possibility of early initiation of etiotropic therapy to improve the prognosis of IUI [Infectious morbidity in the Russian Federation. Information collections of statistical and analytical materials. - Moscow: Federal State Institution of Health " Federal Center for Hygiene and Epidemiology" of Rospotrebnadzor, 2000-2012; Dolgikh T. I. Modern possibilities of laboratory diagnostics of infectious diseases (methods, algorithms, interpretation of results) / Omsk: [b. i.], 2005. - 27 p .; Dyachuk E. V. Clinical and laboratory characteristics of cytomegalovirus infection in pregnant women and children of the first year of life: specialty 14.01.09 "Infectious diseases", 14.01.01 "Obstetrics and gynecology": author's abstract . dis . for a PhD in medicine / Altai State Medical University. - St. Petersburg, 2012. - 23 p. - Place of protection : S. M. Kirov Military Medical Academy.].

It is recommended to conduct an analysis for TORCH infections before conception or in the first trimester of pregnancy. Based on the results obtained, adhere to the tactics of its management agreed upon with a gynecologist. To prevent rubella, get vaccinated against rubella (after vaccination, pregnancy can be planned no earlier than 3 months later); to prevent toxoplasmosis, avoid contact with cats (young individuals are especially dangerous) and cleaning the cat litter box, avoid working with soil, or work only with gloves; wash all vegetables, fruits, and greens thoroughly before eating, avoid contact with raw meat, and boil or fry all meat dishes thoroughly. There is no specific prophylaxis for cytomegalovirus and herpes simplex virus, so women who do not have protective antibodies remain at risk of contracting these infections. It is also necessary to examine the child's father for antibodies to cytomegalovirus and herpes simplex virus type 2 in order to exclude the source of infection [Some infections of the TORCH complex / M. L. Alekseeva, V. G. Kolodko, S. M. Mullabaeva et al.]. // Problems of reproduction. - 2007.

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Prevention of TORCH infections

- Before pregnancy:
 - Conducting screening for TORCH infections.
 - Vaccination against rubella (if not immune) at least three months before conception.
 - Treatment of chronic infections before pregnancy.
- During pregnancy:
 - Avoid contact with people with infectious diseases.
 - Observe personal hygiene rules (especially when caring for cats, to prevent toxoplasmosis).
 - Get regular monitoring tests.
- Lifestyle:
 - Balanced nutrition to maintain immunity.
 - Avoid raw meat and under-processed foods (source of toxoplasmosis).

Conclusion

TORCH infections pose a serious threat to pregnant women and their future children. However, modern diagnostic and prevention methods can significantly reduce the risks. Regular medical supervision, adherence to prevention recommendations, and timely treatment are key steps towards the birth of a healthy child.