INFLUENCE OF CYTOMEGALOVIRUSES ON FETAL DEVELOPMENT

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Annotation;This article analyzes the effect of cytomegalovirus (CMV) infection on fetal development, its pathogenesis, clinical manifestations and preventive measures. Cytomegalovirus is a DNA virus belonging to the herpesvirus family, which is latent in most people and is activated in conditions of weakened immune systems. The development of primary or recurrent CMV infection in a pregnant woman can cause intrauterine infection. The article discusses the mechanisms of virus transmission to the fetus through the placenta, as well as morphological and functional changes in embryonic and fetoplacental development. CMV-infected fetuses are mainly characterized by pathologies such as central nervous system damage, developmental defects of the hearing and vision organs, microcephaly, and intrauterine growth retardation. The article also presents diagnostic methods (serological tests, PCR), preventive and therapeutic measures, and recommendations for preventing CMV infection during pregnancy. The results of the study indicate the need for early detection and monitoring of CMV infection in pregnant women.

Keywords: cytomegalovirus, fetal development, intrauterine infection, placenta, birth defects, prevention.

Аннотация. В статье анализируется влияние цитомегаловирусной (ЦМВ) инфекции на развитие плода, её патогенез, клинические проявления и профилактические меры. Цитомегаловирус – ДНК-содержащий вирус семейства герпесвирусов, который у большинства людей находится в латентной форме и активируется при снижении иммунитета. Развитие первичной или рецидивирующей ЦМВ-инфекции у беременной женщины может привести к внутриутробному инфицированию. В статье рассматриваются механизмы передачи вируса плоду через плаценту, а также морфофункциональные изменения эмбрионального и фетоплацентарного развития. Для плодов,

инфицированных ЦМВ, характерны такие патологии, как поражение центральной нервной системы, пороки развития органов слуха и зрения, микроцефалия и задержка внутриутробного развития. В статье также представлены методы диагностики (серологические исследования, ПЦР), профилактические и лечебные мероприятия, а также рекомендации по профилактике ЦМВ-инфекции во время беременности. Результаты исследования свидетельствуют о необходимости раннего выявления и мониторинга ЦМВ-инфекции у беременных женщин.
Ключевые слова: цитомегаловирус, развитие плода, внутриутробное инфицирование, плацента, врожденные пороки развития, профилактика.

Introduction. Among viral infections, cytomegalovirus (CMV) infection is currently one of the most pressing problems in medicine and perinatology. Cytomegalovirus is a DNA-containing virus belonging to the Herpesviridae family, which remains latent in the human body for a long time and is reactivated when the immune system is weakened. Despite the fact that a large part of the population, especially women of reproductive age, is infected with this virus, the infection often proceeds without clinical symptoms. However, the development of primary or recurrent CMV infection during pregnancy can lead to serious consequences for the fetus.

The fetus is infected with CMV most often through the placenta, and sometimes during childbirth or during breastfeeding. As a result of intrauterine infection, severe pathological changes are observed in the central nervous system, hearing and vision organs, liver, spleen and other organs of the fetus. As a result, complications such as congenital CMV infection, microcephaly, sensorineural hearing loss, and developmental delay occur. Therefore, early detection of cytomegalovirus infection during pregnancy, regular screening of women, and the development of preventive measures are of great importance. This article discusses the impact of cytomegalovirus infection on fetal development, pathogenesis mechanisms, clinical symptoms, and prevention issues.

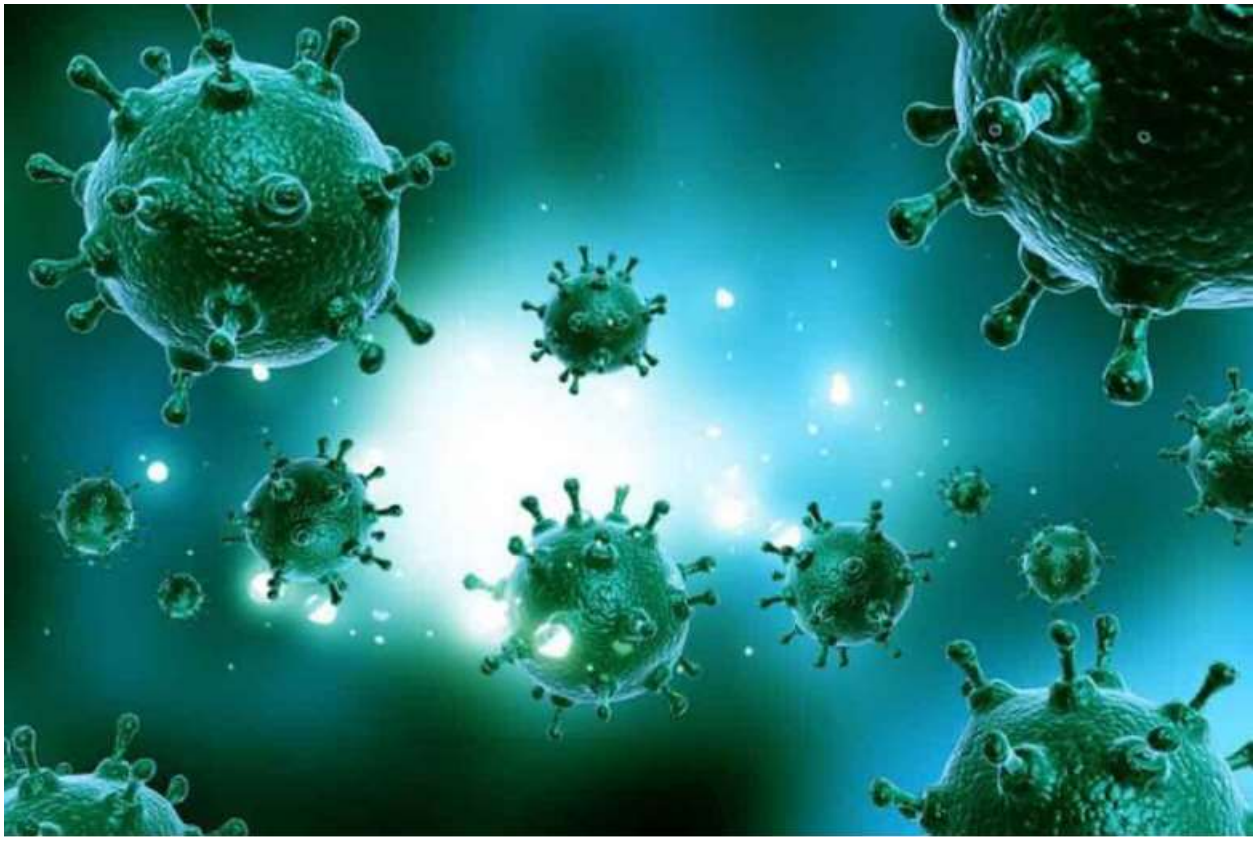
Of course, the main part of the article on the topic “The impact of cytomegaloviruses on fetal development” is presented below, without paragraphs, continuously, in detail and expanded in a scientific manner:

Cytomegalovirus (CMV) infection is one of the most important intrauterine infections in modern medicine during pregnancy. This virus belongs to the Herpesviridae family, contains double-stranded DNA and is 150–200 nanometers in size. CMV multiplies in

epithelial, endothelial, leukocyte and fibroblast cells in the human body. One of the most important features of the virus is its ability to remain latent for a long time. Usually, the infection is asymptomatic in healthy people, but in people with weakened immune systems, especially pregnant women, it becomes active and causes serious damage to the development of the fetus. The virus is often transmitted from mother to fetus through the placenta. If the primary infection occurs in the first trimester of pregnancy, the central nervous system, organs of vision and hearing, liver, spleen and heart function of the fetus are significantly damaged. CMV damages the cells of the placental barrier and disrupts blood circulation, resulting in hypoxia and growth retardation in the fetus. After the virus crosses the placental barrier, it multiplies in trophoblast and endothelial cells and enters the fetal circulatory system. This causes the virus to enter the brain and nervous tissue. As a result of damage to neuronal cells, pathologies such as microcephaly, hydrocephalus, intracranial calcifications, damage to the optic and auditory nerves, and mental retardation occur. Children infected with CMV intrauterinely at birth or in the following months develop clinical signs such as jaundice, hepatosplenomegaly, hemolytic anemia, pneumonia, low birth weight, and sensorineural hearing loss. In some cases, the infection is latent and the baby appears healthy at first glance, but in later years, late complications such as developmental delay, mental retardation, speech disorders, and hearing loss occur. According to epidemiological data, primary CMV infection is detected in 0.5–2% of pregnant women worldwide, and intrauterine damage occurs in approximately 30–40% of them. Therefore, CMV infection is recognized as the most common viral cause of neonatal death and birth defects. Among the diagnostic methods, serological tests (detection of IgM and IgG antibodies) and polymerase chain reaction (PCR) are the most reliable. The presence of IgM antibodies indicates an active phase of infection, while low avidity of IgG indicates a recent infection. Ultrasound examination of the fetus may reveal signs such as microcephaly, ventriculomegaly, growth retardation, and enlargement of the liver and spleen. In doubtful cases, detection of viral DNA from amniotic fluid by amniocentesis confirms intrauterine infection. Treatment options are limited, and antiviral drugs such as ganciclovir, valganciclovir, and foxarnet are used, but they are used only when necessary during pregnancy, as there is a risk of embryotoxic effects. In some cases, it has been found that the administration of specific CMV immunoglobulin to pregnant women can reduce the risk of fetal damage. The most effective way is prevention. It is important to conduct serological screening of pregnant women for CMV, strictly observe personal hygiene rules, avoid contact with saliva or urine when working with young children, test donor blood and organs for CMV, and implement measures to strengthen immunity. The social and medical

importance of CMV infection is that it is a major cause of not only birth defects, but also hearing loss and mental retardation in childhood.

Therefore, it is important for each country to implement a strategy for early detection and prevention of CMV infection in its health system. Scientific studies have shown that determining the immune status against CMV infection before and during pregnancy plays an important role in reducing the risk of viral reactivation and ensuring the birth of a healthy offspring.



Cytomegalovirus and its impact on fetal development

Cytomegalovirus (CMV) is a common pathogen belonging to the herpesvirus family, which poses a serious threat to the health of the mother and fetus during pregnancy. The virus can usually exist in a latent state, but when immunity is weakened, it can become actively activated and infect the fetus. CMV infection in pregnant women disrupts the process of fetal organogenesis, which can lead to complications during childbirth and developmental defects.

Transmission of the virus to the fetus

Cytomegalovirus is transmitted to the fetus through the maternal bloodstream. The first trimester of pregnancy is especially dangerous, since during this period the fetal organs are forming. As a result of infection of the virus to the fetus, delays in the development of organs and systems, necrotic changes in cells and tissues, as well as a weakening of the fetal immune system are observed. All this increases the risk of severe

complications during childbirth, including central nervous system disorders and internal organ failure.

Mechanisms of effect on the fetus

CMV harms the fetus through several mechanisms. The virus enters cells and destroys them, which leads to tissue necrosis and insufficient development of organs. At the same time, the virus activates inflammatory processes, which are manifested by an increased immune response and tissue damage. Important organs such as the central nervous system, liver, kidneys and heart are especially affected.

Clinical signs and complications

Women infected with CMV during pregnancy may develop various clinical signs as a result of virus transmission to the fetus. Central nervous system disorders are manifested by delayed brain development of the fetus, impaired cognitive and motor activity. Also, due to insufficient development of the sensory organs - ears and eyes, hearing loss and vision problems occur. Pathological changes may develop in internal organs, including the liver, kidneys and heart systems. The overall growth of the fetus slows down, and height and weight are below normal.

Fetal protection and prevention

There are several important measures to protect the fetus from cytomegalovirus. Monitoring CMV infection in pregnant women, that is, early diagnosis can be made by detecting antibodies to the virus in the blood and urine. Compliance with hygiene rules is especially important, since the virus is often transmitted through children. It is necessary to support the fetus and the mother's body by strengthening immunity. If necessary, antiviral drugs can be used under the supervision of a doctor, but their safety for the fetus is always taken into account.

Research and observations

Modern scientific studies show that CMV infection in the first trimester of pregnancy has the greatest negative impact on fetal development. Therefore, regular medical monitoring and laboratory tests during pregnancy play an important role in reducing the negative consequences of the virus.

Cytomegalovirus Prevention and Treatment

Cytomegalovirus (CMV) requires a number of preventive and treatment measures to reduce the negative impact on the fetus and protect against infection. These measures can be used before, during, and after pregnancy.

Pre- and ongoing prevention

The most effective way to prevent CMV infection is to use preventive measures before and during pregnancy. Good hygiene among women, especially women who have contact with children, reduces the risk of transmission of the virus. Regular hand

washing, keeping the face and mouth clean, and ensuring food and water safety significantly reduce the likelihood of infection to the fetus.

Laboratory monitoring

For early detection of CMV infection during pregnancy, it is important to detect antibodies to the virus in the blood and urine. If the presence of the virus is detected, special monitoring is carried out under the supervision of a doctor. This allows for early detection of negative changes in the development of the fetus and the application of appropriate measures.

Treatment and antiviral drugs

There are special antiviral drugs against cytomegalovirus that slow down the reproduction of the virus and reduce the amount of damage to the body. At the same time, the use of drugs is carried out only under the supervision of a doctor, since it is necessary to take into account their safety for the fetus. During treatment, the development of the fetus is monitored by regular ultrasound and laboratory tests.

Strengthening immunity

Strengthening the mother's immunity during pregnancy plays an important role in reducing the negative effects of CMV infection. A healthy lifestyle, proper nutrition, adequate sleep and stress reduction strengthen the body's natural defense mechanisms. This slows down the activation of the virus and reduces the risk of transmission to the fetus.

Postpartum monitoring

If CMV infection is detected during pregnancy, the mother and baby will undergo continuous medical monitoring after delivery. If the baby has signs of viral infection or developmental defects, they will be identified in a timely manner and appropriate treatment measures will be taken. In this way, complications can be prevented and the baby's health can be ensured.

Conclusion

Cytomegalovirus (CMV) is a pathogen that poses a serious threat to the health of the mother and fetus during pregnancy. Infection of the fetus with the virus causes developmental disorders of various degrees in the organs and systems of the fetus. Especially in the case of infection in the first trimester, the central nervous system, heart, liver, kidneys and sensory organs are affected, which leads to serious complications such as delayed brain development, impaired cognitive and motor activity, and reduced hearing and vision. In addition, the overall growth of the fetus slows down, and its height and weight may be below normal. Preventive measures are important to reduce the impact of cytomegalovirus on the fetus and prevent the spread of infection. Strict adherence to hygiene rules, especially limiting contact with children

and infected people, significantly reduces the risk of virus transmission. Laboratory tests and monitoring of viral antibodies during pregnancy allow early detection of negative changes in the development of the fetus. At the same time, strengthening immunity - through a healthy lifestyle, proper nutrition, adequate sleep and stress reduction - slows down the activation of the virus and reduces the risk of infection of the fetus. If necessary, the use of antiviral drugs under the supervision of a doctor reduces the amount of damage to the fetus and prevents the severe course of infection. Regular medical monitoring after childbirth is important for timely detection of viral infection or developmental defects in the baby, the use of necessary treatment measures and the reduction of complications. In conclusion, a thorough study of the negative effects of cytomegalovirus on the fetus, the use of effective preventive and therapeutic measures against infection are important for maintaining the health of the mother and baby, preventing infectious diseases and reducing complications during childbirth. At the same time, regular medical monitoring, a healthy lifestyle, immunity support, and strict adherence to hygiene rules significantly reduce the impact of the virus on the fetus and ensure the full, healthy development of the fetus.