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A Comprehensive Review of TORCH Syndrome: Characterization and Prevention Strategies

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Abstract:

Introduction: TORCH syndrome refers to a group of symptoms caused by congenital infections with teratogenic pathogens, including Toxoplasma gondii, Varicella, Treponema pallidum, Parvovirus B19, Rubella, Cytomegalovirus (CMV), and Herpes simplex virus (HSV). It can also encompass infections like HIV, Zika virus (ZIKV), hepatitis B, and SARS-CoV-2. These pathogens can pass through the placenta, overcoming various placental barriers. Infections during pregnancy can result in severe consequences for both the fetus and the mother. Common symptoms in newborns include low birth weight, rashes, hepatosplenomegaly, cardiac anomalies, jaundice, chorioretinitis, and microcephaly, with 2% to 3% of congenital anomalies attributed to perinatal infections. The incidence of these infections varies globally.

Purpose of the work: This study aims to review and characterize TORCH syndrome and the prevention of TORCH infections.

Materials and methods: A comprehensive analysis of research papers available on PubMed, Google Scholar, Web of Science, Embase and Scopus was undertaken using the searchterms encompassing the following keywords: TORCH syndrome / infections during pregnancy / perinatal infections / Toxoplasmosis / Rubella / CMV infection / Herpes Simplex Virus infection / Parvovirus B19 / *Treponema pallidum* / vaccinations before and during pregnancy / maternal nutrition.

Results: TORCH syndrome is a significant issue causing congenital diseases, premature births, and intrauterine deaths, impacting babies throughout their lives. Most complications can be prevented with proper prophylaxis and early treatment. Increasing awareness and providing education for women from preconception through the early postnatal period is essential. Addressing TORCH syndrome remains a major medical challenge, but improving management offers hope for better outcomes.

Keywords: TORCH syndrome, perinatal infections, Toxoplasmosis, Rubella, CMV infection, Herpes Simplex Virus infection

Introduction

TORCH syndrome is a set of symptoms caused by congenital infection by a group of pathogens with teratogenic effects. These microorganisms include bacteria, viruses, and parasites. TORCH infection classically encompasses:

- *Toxoplasma gondii*
- Other infections (*Varicella*, *Treponema pallidum*, Parvovirus B19)
- Rubella
- *Cytomegalovirus* (CMV)
- Herpes simplex virus (HSV).

In the group of congenital infections classified under the TORCH complex, the human immunodeficiency virus (HIV), Zika virus (ZIKV), hepatitis B virus, and SARS-CoV-2 virus,

which during pregnancy is associated with a potential risk of transmission to the fetus, are sometimes also included [1,2,3].

Infectious agents such as bacteria, viruses, and other microorganisms can pass between the mother and the baby in the uterus. This situation is called vertical transmission, also known as mother-to-child transmission. The pathogen reaches the placenta through the mother's blood or the reproductive tract of the pregnant woman and must have the ability to overcome the placental barriers - syncytiotrophoblast interface, decidual–trophoblast interface, and physical obstacles composed of fetal cells and the maternal tissues [4,5,6].

The prognosis for TORCH infections may vary depending on the severity of the initial symptoms. The first symptoms of infection can appear at different times, such as the intrauterine period, at birth, in infancy, or even only years later. Infections during pregnancy can cause serious consequences for both the developing fetus and the pregnant mother. Physical examination of infants may reveal abnormal growth parameters or developmental abnormalities. Various syndromes relatively often overlap with the clinical condition of the newborn. The most common symptoms in newborns include low birth weight, rashes that can be maculopapular, purpuric, or petechial, hepatosplenomegaly, cardiac anomalies, jaundice, chorioretinitis, and microcephaly. Of all congenital anomalies, approximately 2% to 3% are attributed to perinatal infections. The incidence of these infections varies depending on the region of the world [1,2].

Congenital Toxoplasmosis

Toxoplasmosis infection affects more than 60% of certain populations. In healthy and immunocompetent adults, more than half of the cases of infection are asymptomatic but may cause self-limiting symptoms such as malaise, fever, maculopapular rash, headache, and tender lymphadenopathy. Oocysts grow faster and develop better in regions with hot, low-altitude, and humid climates, which is why seroprevalence rates are dependent on geographical areas. Only congenital CMV is observed more frequently than congenital toxoplasmosis among infections acquired transplacentally. Congenital toxoplasmosis develops in the fetus when the mother's parasite infection occurs shortly before conception or during pregnancy, and when an old infection is reactivated during immunosuppression. In Poland, 14 cases of congenital

toxoplasmosis were reported in 2019, and in 2020 there were 9 cases. The risk of transmission to the fetus in Europe ranges from 1.6 to 3.5 per 1000 births, but no more than 22% of these infected fetuses will develop congenital toxoplasmosis. The risk of transmission is highest at the end of pregnancy (15% in the first trimester, 30% in the second trimester, and 60% in the third trimester). However, in over 80% of infections during the first trimester of pregnancy, the virus may cause miscarriage, intrauterine death, or very severe damage to the fetus [1,7,8,9].

Oocysts - the stage of *Toxoplasma gondii*, cause toxoplasmosis through inhalation of fecal particles or by the ingestion of infected tissue. When the mother gets infected there is a transplacental transmission of the parasite to the fetus causing congenital toxoplasmosis [4,5,6].

Congenital toxoplasmosis can present with a wide range of clinical symptoms, ranging from no symptoms at all at birth (about 75% of cases) to severe neurological and ocular conditions. Although only a few infected newborns exhibit the classic triad of chorioretinitis, hydrocephalus, and cerebral calcifications, this triad is a notable indicator. The condition may manifest through intrauterine growth restriction and low birth weight, along with neurological issues such as microcephaly or macrocephaly, seizures, nystagmus, hydrocephalus, cerebral calcifications, and meningoencephalitis. Additionally, affected infants might experience chorioretinitis, jaundice, hepatosplenomegaly, and thrombocytopenia [1,7]. Conversely, maternal infection is often subclinical, with symptoms presenting in only 5% of cases [10].

Children with congenital toxoplasmosis may face early death due to severe infection, while others may survive but develop neurological disorders. Retinochoroiditis is the most common outcome of congenital toxoplasmosis, but intellectual disability, hearing loss, and seizures can also emerge, sometimes even years later, in children who were asymptomatic at birth [11,12].

Opinions on drug regimens vary widely. To prevent intrauterine infection, fetal prophylaxis primarily involves the use of spiramycin. For the treatment of an evolving fetal infection, a regimen combining pyrimethamine, a sulfonamide (such as sulphadiazine or sulphadoxine), and folic acid is used [7].

Pregnant women should be aware of certain practices that can help prevent infections for both themselves and their babies. While general guidelines, such as handwashing and avoiding contact with individuals who have contagious diseases, are important, there are also specific precautions for each type of pathogen. To reduce the risk of infections, including congenital toxoplasmosis, the following practices should be observed:

- Always wash your hands before preparing or eating food.

- Clean your hands thoroughly after handling raw meat, and ensure that utensils such as knives and cutting boards are properly washed after coming into contact with uncooked meat.
- Daily clean the cat litter box to remove oocysts before they can develop into an invasive form.
- Wear gloves when handling litter boxes or working in the garden, and wash your hands afterward to minimize the risk of contamination from cat excrement.
- Rinse fruits and vegetables thoroughly before consumption.
- Filter water before drinking it.
- Avoid contact with stray cats.
- Refrain from eating raw or undercooked meat [13,14].
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'O' others pathogens: Congenital Varicella Syndrome

Infants who are infected perinatally with the varicella-zoster virus can develop skin lesions, limb hypoplasia, neurological issues, and developmental delays. Pregnant women, especially those with young children, are frequently exposed to chickenpox. However, primary infections are rare because most pregnant women have already developed immunity. It is estimated that this situation affects 0.7 to 3 per 1,000 pregnant women. Both the varicella-zoster virus (VZV) and the rubella virus spread via aerosols from infected individuals and can also be transmitted transplacentally from the mother to the fetus [1,15].

Treatment for chickenpox in pregnant women is essential, regardless of the severity of the infection, due to evidence suggesting it can help reduce the risk of the virus crossing the placenta. If vaccination history is unknown or if the woman has been exposed to someone with chickenpox, conducting immunological tests is advisable. Based on the results, Varicella Zoster Immune Globulin (VZIG) should ideally be administered within 96 hours of exposure. For women who contract the disease, acyclovir is the recommended treatment. Additionally, post-exposure prophylaxis is available for newborns whose mothers had chickenpox from 5 days before to 2 days after delivery. This prophylaxis involves administering specific immunoglobulin VZIG. If the newborn shows clinical signs of active infection, intravenous acyclovir should be given [15].

The prognosis for infants diagnosed with congenital varicella syndrome is concerning. Approximately 30% of these infants do not survive, often due to complications such as persistent gastrointestinal reflux, severe recurrent aspiration pneumonia, and respiratory failure. For those with untreated disease, the mortality rate is 31%. Pregnant women are advised to avoid contact with individuals infected by the varicella-zoster virus [16,17].

'O' others pathogens: Congenital Syphilis

Annually, around 5.6 million people around the globe are diagnosed with syphilis, and this number continues to rise both in Poland and internationally. Experts suggest that changes in sexual behavior might be contributing to this increase. According to the National Institute of Public Health - National Institute of Hygiene in Poland, there were 710 reported cases of syphilis in 2020, including 3 cases of congenital syphilis, compared to 1607 cases (with 14 cases of congenital syphilis) in 2019. However, it's possible that the 2020 figures are underreported due to the Covid-19 pandemic. These statistics only cover reported cases from sanitary-epidemiological stations. Since syphilis is treatable, the majority of congenital syphilis cases are found among untreated women [1,9,18].

In the case of congenital syphilis, vertical transmission primarily happens through the placenta but may also occur through contact with vaginal fluids during childbirth.Treponema pallidum is a well-known teratogen. Pregnant women with syphilis who receive penicillin treatment can prevent congenital syphilis in 98% of cases. However, untreated cases may lead to fetal loss or hydrops fetalis. In infants who do not receive treatment, symptoms typically emerge around three months of age and include cutaneous lesions on the palms and soles, hepatomegaly, jaundice, rhinitis, rash, and generalized lymphadenopathy [10,18].

Immediate diagnosis and treatment of Treponema pallidum infection are crucial. Pregnant women who test positive for the infection must receive mandatory treatment. For neonates born to mothers who were properly treated during pregnancy and more than four weeks before delivery, or those who have a non-reactive Rapid Plasma Reagin (RPR) test, the recommended therapy is a single intramuscular dose of benzathine penicillin G, 50,000 units/kg. Infants with confirmed congenital syphilis should be treated with aqueous crystalline penicillin G, 50,000 units/kg intravenously every 12 hours during the first seven days of life, followed by further treatment as directed [2,18]. The clinical manifestations of congenital syphilis include:

- stillbirth,
- neonatal death,
- nonimmune hydrops,
- early congenital syphilis,
- classic stigmata of late congenital syphilis.

Early congenital syphilis typically presents with symptoms during the perinatal period, though many infected infants are asymptomatic at birth. Notable signs of early congenital syphilis, which appears before the age of 2, include a maculopapular rash (often not affecting the palms and soles and may desquamate), snuffles, jaundice, periostitis, osteochondritis, chorioretinitis, and congenital nephrosis [19,20,21].

Late congenital syphilis is diagnosed in cases where the condition is identified more than 2 years after birth. Neurological symptoms, such as eighth cranial nerve deafness, typically emerge between the ages of 8 and 10. Interstitial keratitis, which often affects both eyes, usually appears in individuals between the ages of 5 and 20. Additionally, chronic meningoencephalitis can result in intellectual decline, commonly referred to as juvenile paresis [19,22,23]. The Hutchinson triad consists of eighth cranial nerve deafness, interstitial keratitis, and Hutchinson teeth, which are characterized by notched, thin upper incisors with irregular spacing. Furthermore bone lesions may result in depression of the bridge of the nose (saddle nose), destruction of the palate, anterior bowing of the tibia (saber shins), maldevelopment of the maxilla, and knee joint can be affected with hydrarthrosis (Clutton's joints) [19,23]. It is important for pregnant women to avoid risky sexual behavior, limit the number of sexual partners, use condoms, and avoid direct contact with primary skin lesions present on the body of an infected person [24].

‘O’ others pathogens: Parvovirus B19 infection

Parvovirus B19 infection during pregnancy can result in outcomes ranging from an uncomplicated pregnancy to severe conditions such as non-immune hydrops, fetal anemia, and intrauterine fetal death. The rate of fetal loss is higher before 19 to 20 weeks of gestation compared to after 20 weeks. Parvovirus B19 can cause spontaneous abortion, severe neurodevelopmental deficits, and hydrops fetalis. Although, 67 to 76% of infants are unaffected even if the mother was infected [1,25].

There is no treatment available for the infectious agent, nor are there methods for active (vaccine) or passive (immunoglobulin) immunization. If a maternal infection is confirmed before the 20th week of pregnancy, appropriate fetal monitoring is initiated [10]. Frequent handwashing and avoiding close contact with young children can help prevent infection [26].

'O' others pathogens: ZIKV infection, congenital HIV, SARS-CoV-2 infection

Zika virus (ZIKV) infection can result in neurological issues such as Guillain-Barré syndrome and peripheral nerve involvement. Although the symptoms of Zika virus are generally mild and self-limiting, an increase in microcephaly incidence among newborns has been linked to maternal Zika virus infection [27,28]. Congenital Zika syndrome is characterized by microcephaly, limb or joint issues, hypertonia, damage to the back of the eye, hearing impairments, and brain atrophy. While some infants with a smooth brain may not experience severe health problems, others may cease to develop after 3 to 5 months and many unfortunately do not survive beyond 2 years [29].

To reduce the risk of Zika virus infection, women should avoid traveling to areas where the virus is known to be present. In regions with a risk of Zika, protect yourself from mosquito bites by wearing protective clothing, using mosquito nets, and applying EPA-registered insect repellents. Additionally, women should also avoid sexual contact with individuals who may be infected by the Zika virus and use condoms to further minimize the risk of transmission [30].

For congenital HIV, the clinical manifestations can be varied and often nonspecific. Patients may exhibit symptoms such as lymphadenopathy, hepatosplenomegaly, microcephaly, oral candidiasis, and invasive bacterial infections [2]. Preventing mother-to-child transmission and managing newborns effectively relies on achieving viral suppression during pregnancy. For infants born to mothers with a low viral load, zidovudine (4 mg/kg, administered twice daily) should be given for the initial 4 to 6 weeks of life. In cases where pregnant women are not on antiretroviral therapy, multiple drug regimens are employed [27].

The outlook for infants born to HIV-positive mothers is concerning. Without prompt treatment, the disease can progress swiftly, leading to a mortality rate exceeding 90%. On average, the time from infection to death is around 8-10 years. Many neonates may not show any symptoms and can remain asymptomatic until they are 3-5 years old [31,32].

Common signs of HIV infection often include:

- Increased susceptibility to opportunistic infections

- Recurrent bacteremia
- Generalized lymphadenopathy, splenomegaly, and hepatomegaly
- Oral candidiasis
- Various cancers
- Growth delays
- Cognitive development delays

Administering antiretroviral therapy during pregnancy significantly reduces the risk of HIV transmission to the baby during pregnancy, childbirth, and the postpartum period. With the use of effective strategies, the transmission rate of HIV to newborns has been lowered to less than 1% [32,33].

Recent case reports involving pregnant women with COVID-19 highlight potential risks to their fetuses. Infants born to mothers infected with SARS-CoV-2 may exhibit symptoms such as shortness of breath, fever, thrombocytopenia, abnormal liver function tests, tachycardia, vomiting, and pneumothorax [3].

Congenital Rubella

Prior to the vaccine's introduction, congenital rubella syndrome affected up to 4 infants per 1,000 live births. The rubella vaccine (RCV) is both safe and effective, with a single dose providing approximately 97% protection against the disease. In Poland, since 1989, selective vaccination of adolescent girls has been credited with a significant decrease in cases, accounting for 81% of infections among males aged 15 to 29 during the 2013 outbreak. During this epidemic, the risk of congenital rubella increased in early pregnancy, with 2 reported cases; however, this number was likely underestimated. Since then, Poland has not reported any further cases of congenital rubella [34,35].

The symptoms of transmitted infections vary depending on the pathogen and the stage of pregnancy at which the infection occurs. For instance, rubella virus infection during the early months of pregnancy can lead to miscarriage, whereas after 22 weeks of gestation, it poses no significant risk to the fetus [36].

Up to 85% of infants born to mothers who were infected with rubella during the first 12 weeks of pregnancy develop congenital rubella syndrome [1]. The main symptoms of

congenital rubella syndrome encompass sensorineural deafness, cataracts, heart defects, central nervous system issues, developmental delays, bone abnormalities, and hepatosplenomegaly. Prevention plays a crucial role, as a single dose of the rubella vaccine administered to the mother before pregnancy can provide lifelong immunity. Once congenital rubella syndrome has developed, there is no available cure. Pregnant women should avoid contact with individuals showing symptoms of rubella [37,38].

The prognosis for congenital rubella varies based on the timing of maternal infection:

- Infection during the initial weeks of pregnancy can lead to fetal death or miscarriage.
- Infection during the first or second trimester is associated with a range of birth defects.
- Infection occurring after the 22nd week of pregnancy generally does not pose a risk to the fetus [36].

Congenital CMV infection

Congenital CMV infection is among the most prevalent intrauterine viral infections, accounting for 10% to 40% of cases. Globally, it is estimated that 30% to 80% of individuals have antibodies indicating a past CMV infection. In Poland, nearly 80% of women of reproductive age have anti-CMV antibodies prior to conception, with prevalence increasing with age (from 74.3% to 94.2%). The highest risk of transplacental transmission (30% to 35%) is linked to primary infections. However, due to high seroprevalence, congenital infections typically result from non-primary maternal infections, which have a much lower transmission risk (1.1% to 1.7%). Congenital CMV infection has a mortality rate of up to 30%. Globally, this infection occurs in 5-7 out of every 1000 live births. Approximately 10% of these cases show symptoms, while the remaining 90% are asymptomatic. Among infants with asymptomatic CMV, up to 13.5% experience late and severe complications, primarily sensorineural hearing loss [2,39,40].

Cytomegalovirus is primarily spread through mucous membranes, blood transfusions, or organ transplants. It can be transmitted from mother to fetus via the placenta and also through contact with cervical or vaginal secretions during childbirth.

Cytomegalovirus is the most common congenital infection. Pregnant women with CMV often do not show symptoms, but when they do, they resemble those of an EBV infection, including fever, malaise, headache, pharyngitis, lymphadenopathy, hepatosplenomegaly, arthralgias, and rash. 90% of newborns with congenital CMV are born without symptoms.

However, around 10% of congenital CMV cases present clinical signs such as jaundice, petechiae, hepatosplenomegaly, microcephaly, intracranial calcifications, intrauterine growth restriction, pericardial effusion, and ascites. CMV is the main cause of non-genetic congenital hearing loss and can also lead to placental inflammation and fetal death [1,2,10,39,41].

There are no vaccines or safe therapies available for CMV. In certain instances, oral valganciclovir or intravenous ganciclovir may be used. The routine use of CMV hyperimmune globulin (CMV HIG) is not recommended. In the prevention of CMV infections, it is important to:

- Avoid contact with the saliva and urine of young children, especially those under 2 years old (for example: not sharing food, drinks, and utensils with children, and not putting pacifiers in the mother's mouth).
- Wash hands frequently, especially after changing diapers and feeding [39,42].
-

Congenital Herpes Simplex Virus infection

In developed countries, about 50 to 70% of people are seropositive for oral herpes simplex virus (HSV-1). Genital herpes simplex virus (HSV-2) affects 10 to 40% of the population, including approximately 22% of pregnant women. The risk of HSV transmission to the newborn is between 30 to 50% if the infection occurs during the third trimester, while it is around 1% if it happens earlier in pregnancy. In the case of a primary infection towards the end of pregnancy, there is insufficient time for the mother to produce antibodies that would prevent replication. Approximately 85% of perinatal HSV transmission occurs during childbirth. HSV-2 infections generally have a worse prognosis compared to HSV-1 infections [1,43,44].

Herpes simplex virus infections, including HSV-1 and HSV-2, are transmitted through direct contact with mucous membranes, saliva, or sores. The primary mode of transmission to the infant occurs during delivery if the mother has an active infection in the reproductive tract [2].

Congenital infection with Herpes Simplex Virus (HSV-1 and HSV-2) is uncommon but can be life-threatening for newborns. Typically, HSV presents in infants with manifestations affecting the skin, eyes, and mucous membranes (SEM), as well as the central nervous system and other organs. When HSV infects during the first trimester of pregnancy, it may lead to

spontaneous abortions or intrauterine growth restriction. Although the virus rarely crosses the placental barrier, when it does, it can cause severe birth defects, including microcephaly, hepatosplenomegaly, intrauterine fetal death, and growth restriction. Additional symptoms may include viral sepsis, organ failure (such as in the lungs or liver), intravascular coagulation, encephalitis, and a bulging fontanelle [2,43,45].

Primary symptomatic infections caused by HSV-1 and HSV-2 warrant pharmacological treatment. Clinical studies recommend administering high-dose intravenous acyclovir for acute cases, with the length of treatment varying based on the severity of the condition. All infants diagnosed with neonatal HSV disease should undergo ophthalmologic evaluation and neuroimaging. For recurrent infections, acyclovir can be administered starting from the 36th week of pregnancy. This treatment strategy helps decrease the incidence of cesarean sections due to symptomatic infections [43,46].

In prevention, it is recommended to avoid primary infection by refraining from engaging in risky sexual behavior, using condoms, and avoiding sexual activity during the third trimester with men who have a history of herpes [47].

Prevention of TORCH infections

Health education significantly impacts health behaviors, making it crucial for pregnant women due to their unique needs during this period and the influence of their physical and mental health on the fetus. Pregnancy involves considerable changes in the maternal body, which increases the risk of infections and underscores the need for a healthy lifestyle, proper nutrition, and appropriate immunization [48,49].

Vaccinations before and during pregnancy

In Poland, women who are planning to become pregnant are advised to get vaccinated against rubella, measles, mumps, chickenpox, whooping cough, hepatitis B, and influenza if they haven't already been immunized against these diseases. For those who have not had chickenpox, vaccination is recommended. Women should wait at least one month after receiving live-attenuated vaccines (such as those for rubella, measles, mumps, and chickenpox) before attempting to conceive. While live-attenuated vaccines are not recommended during

pregnancy, inactivated vaccines are safe and can be administered during gestation. Vaccinations for influenza and whooping cough are particularly recommended during pregnancy. The ongoing pandemic has led to the addition of another recommended vaccine: COVID-19. Initially, vaccination during pregnancy was not advised, but recent data from the European Medicines Agency now supports the use of COVID-19 vaccines both before and during pregnancy. In Poland, it is recommended to protect women and fetuses from infections caused by TORCH complex pathogens, including Varicella, Rubella, hepatitis B, and SARS-CoV-2 [50,51].

Indications from the website of Centers for Disease Control and Prevention (CDC) coincide with Polish data. The CDC advises MMR vaccination for women who are planning to become pregnant to protect against rubella. Additionally, the chickenpox vaccine is recommended for children, adolescents, and adults who have never had chickenpox and have not been previously vaccinated. Therefore, women of childbearing age are typically vaccinated, or have the opportunity to receive the vaccine before becoming pregnant if they have not already done so [52,53]. During pregnancy, the recommended vaccinations include the inactivated flu vaccine, Tdap, and COVID-19 vaccine. In certain situations, vaccines for Hepatitis A, Hepatitis B, Meningococcal disease, Polio, Anthrax, Rabies, Typhoid, Smallpox, and Yellow Fever may also be administered. The decision to use these vaccines during pregnancy depends on a careful evaluation of the associated risks and benefits [52].

Maternal nutrition

Moderate physical activity and a balanced diet are crucial during pregnancy. A healthy diet not only supports fetal development but also influences the immune system. Maternal nutrition should consist of vegetables, fruits, legumes, and carbohydrates with a low glycemic index and high fiber content, along with fish, olive oil, nuts, adequate protein, and quality fats. Additionally, supplementation with minerals and vitamins is essential. Vitamins A, B, C, D, E, folate, as well as minerals like zinc, iron, and selenium, play a key role in maintaining a healthy immune system during pregnancy. In contrast, malnutrition can weaken immune resistance, making the body more susceptible to infections, including viral ones such as Zika virus and CMV. Food insecurity is associated with an increased risk of HIV transmission from mother to child and can negatively impact the effectiveness of HIV treatment. While it is well-established that malnutrition impairs the immune system, obesity also has detrimental effects on immune

responses. This issue is evident in SARS-CoV-2 infections, where obesity, including during pregnancy, is a significant risk factor for severe COVID-19. Nutritional imbalances and deficiencies can lead to weakened immunity, increasing susceptibility to infections [48].

Conclusions

TORCH syndrome poses a significant and widespread issue, leading to congenital disorders, preterm births, and intrauterine deaths. This condition is particularly concerning because it impacts infants and affects their entire lives. Many complications associated with TORCH infections can be prevented through effective prophylactic measures and early treatment. Increasing awareness about the risks of these infections for women, from preconception through the early postnatal period, is essential, as is providing targeted education for this group. Addressing TORCH syndrome remains a major challenge in modern medicine, but efforts to improve prevention and treatment offer hope for better outcomes and a brighter future for many lives.

Disclosure:

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