
بسم الله الرحمن الرحيم

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متخصص بیماری های عفونی و تب دار

هیئت علمی دانشگاه علوم پزشکی ارومیه

Viral Infections During Pregnancy:

The Big Challenge Threatening Maternal and Fetal Health

Definitions

Vertical Transmission

- Transmission of an infection from mother to fetus or newborn during pregnancy, delivery, or shortly after birth.

Perinatal infection

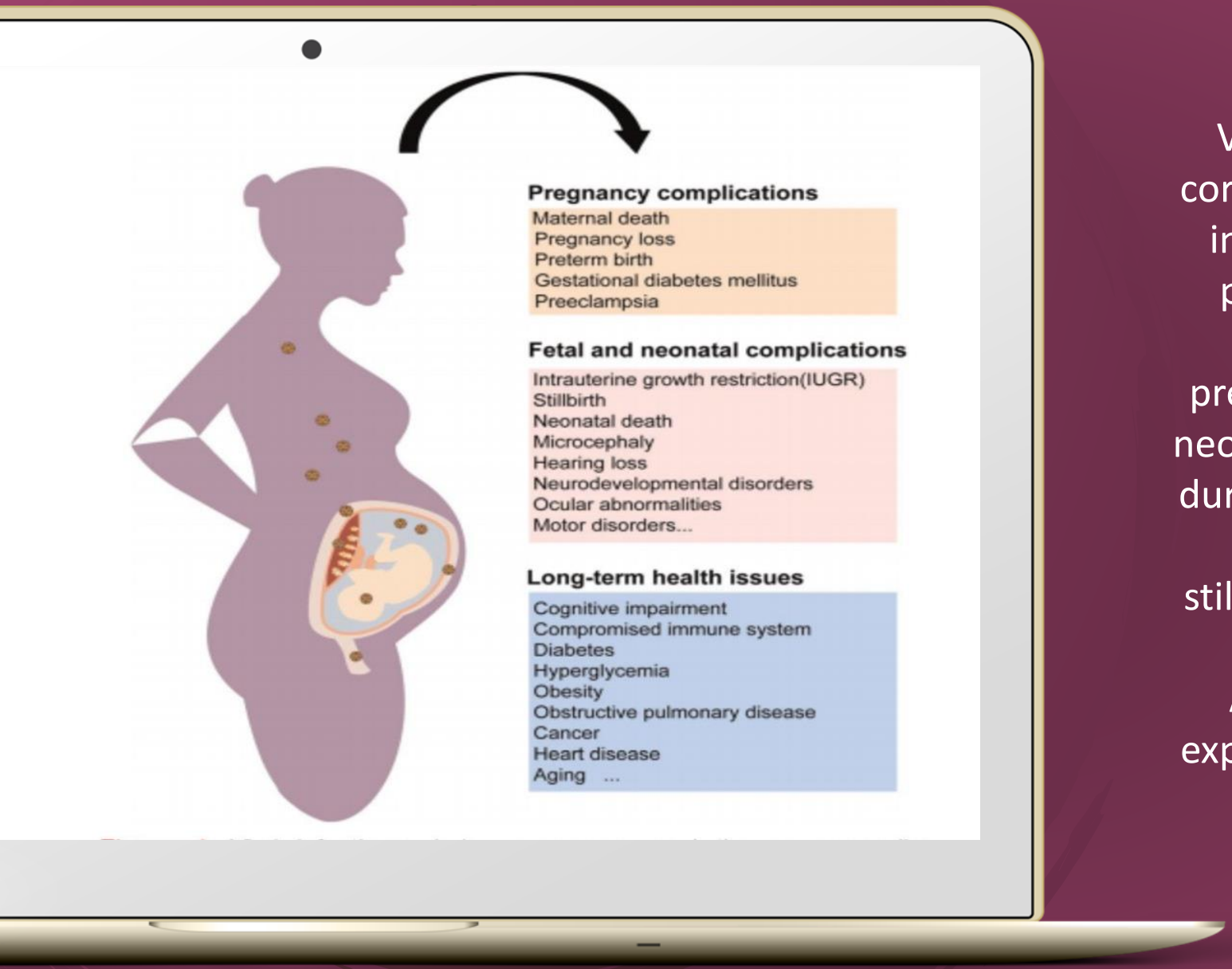
- An infection that occurs during the birth process, acquired through direct exposure to maternal blood or body fluids at the time of delivery. Evidence of the infection is not apparent at birth. In some cases, the infection remains asymptomatic for months (human immunodeficiency virus) or years (hepatitis B, hepatitis C

TORCH

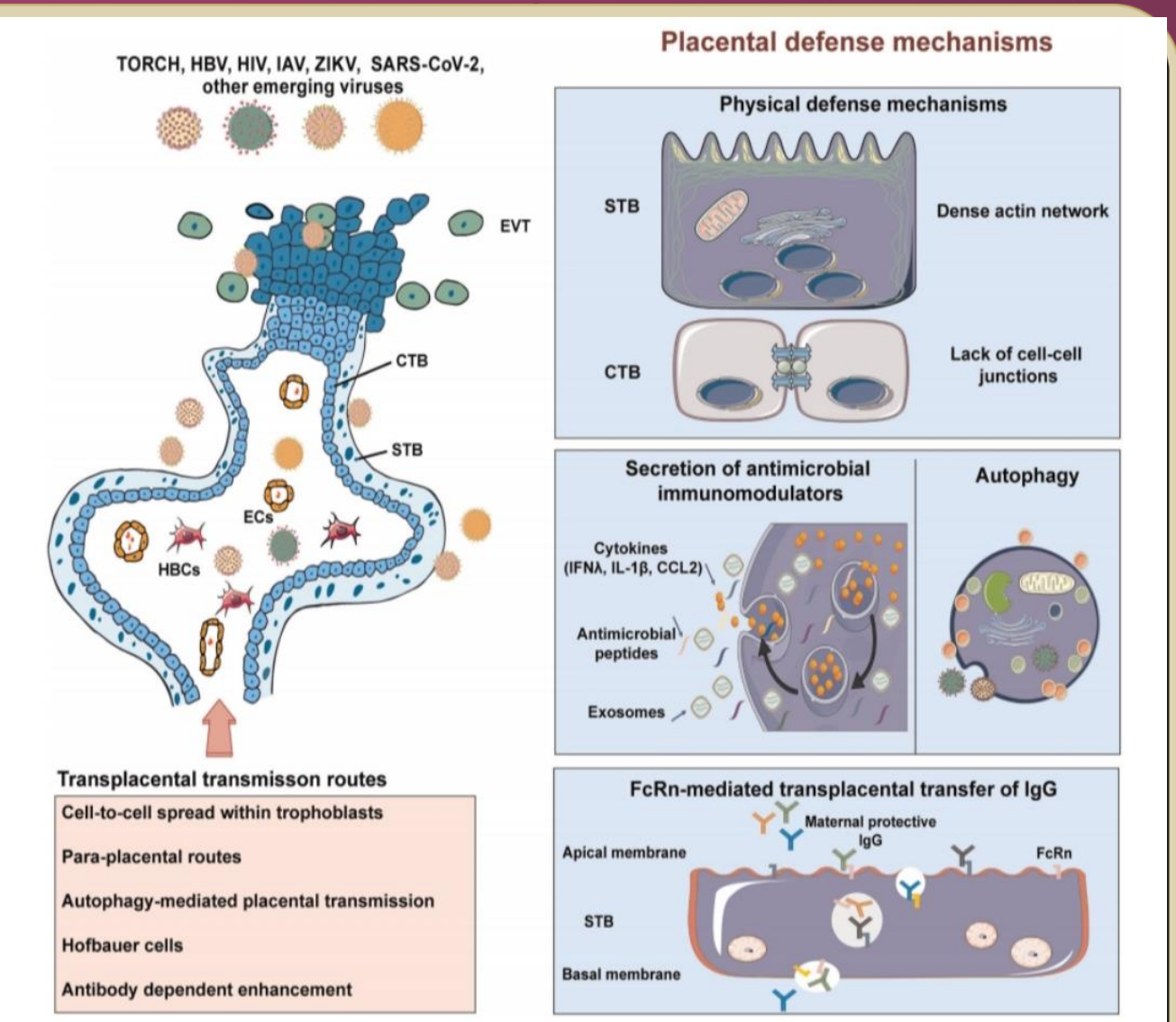
- Once a preferred acronym or mnemonic for the common causes of congenital infections. T was for congenital toxoplasmosis; O was for others and included varicella, syphilis, and parvovirus B19; R was for rubella, C was for cytomegalovirus (CMV); and H for herpes simplex virus (HSV). The list of pathogens now known to be associated with congenital and perinatal infections has expanded significantly, thereby reducing the utility of this memory aid. Neonatal HSV infections are only very rarely congenital. The vast majority occur perinatally, after the newborn is exposed to the virus during the birth process.

Congenital infection

- An infection that occurs in utero, acquired transplacentally. Evidence of the infection may be apparent at birth.



Viral infections during pregnancy and the corresponding maternal-fetal outcomes. Viral infections throughout the entire course of pregnancy can lead to diverse pregnancy complications such as maternal death, pregnancy loss, and preterm birth. Fetal and neonatal anomalies relevant to viral infections during pregnancy, especially the ones causing vertical transmission, can cause IUGR, stillbirth, microcephaly, motor disorders, and other neurodevelopmental disorders. Additionally, the offspring with prenatal exposure to maternal infectious diseases also encounter lifelong health issues.



Placental defense mechanisms against viral infections. The human placenta coxpicita cinnarate collular and molecular mechaniems of antiviral defense, which encompasses the physical or anatomical defenses constitutive release of antimicrobial immunomodulators, autophagy and FcRn mediated antibodies transplacental transfer. OCL :BTC :2 dnagil enikomehc ftiom C-C :2 :TVE :slec lailehtodnE :sCE :tsalbohportotyC tnemgarf latanoen ehT :nicF :tsalbohport suollivartxE ,VBH :sllec reuafboH .sCBH ,rotpecer elbazillatsyrc :suriv ycneicfiedonummi namuH .VIH ,suw B stitiapeH GgI ;A norefretnI ,ANFI ,suriv A azneuflnI VAI etuca ereveS :2-VoC-SRAS G nilubolgonummI :BTS :2 surivanoroc emordnys yrotaripser ,srehtO ,amsalpoxoT :HCROT ,tsalbohportoilycnyS ,saniv xelpmis sepreH dna ,surivolagemotyC ,allebuR suriv akiZ :VKZ

Pathogens with potential for vertical transmis-sion from mother to fetus or child leading to congenital or perinatal infection

Pathogen	Mode of transmission	Notes
Adenovirus	Perinatal	Cause of neonatal viral sepsis with fulminant hepatitis
Cyto-megalovirus	Congenital	Most common cause of congenital infection
Enteroviruses	Perinatal	Cause of neonatal viral sepsis with fulminant hepatitis
Hepatitis B virus	Perinatal	Largely preventable if exposed newborn is given both hepatitis B immune globulin and vaccine immediately after birth
Hepatitis C virus	Perinatal	Approximately 5% of infants born to infected mothers will become infected
Herpes simplex virus	Perinatal (very rare cases of congenital infection occur)	Primary maternal herpes simplex infection at the time of delivery is associated with the highest transmission rates (~50%)

Pathogen	Mode of transmission	Notes
Human immunodefi-ciency virus	Perinatal	Largely preventable if maternal viral load is well controlled; higher risk infants should receive antiretroviral medication for the first 6 weeks of life
Human T-lymphotropic virus I	Perinatal	Many who are infected remain asymptomatic for life, although some develop adult T-cell leukemia and others develop tropical spastic paraparesis
Human T-lymphotropic virus II	Perinatal	Most who are infected remain asymptomatic for life
Lymphocytic choriomeningi-tis virus	Congenital	Strong correlation with chorioretinitis and structural brain defects
Parvovirus B19	Congenital	A cause of hydrops fetalis
Rubella virus	Congenital	Universal childhood vaccination has led to dramatic reductions in or elimination of congenital rubella syndrome
Toxoplasma gondii	Congenital	Protozoan transmitted to pregnant women upon exposure to contaminated meat or exposure to cat feces containing the parasite

Pathogens with potential for vertical transmis-sion from mother to fetus or child leading to congenital or perinatal infection (Continued)

Pathogen	Mode of transmission	Notes
Treponema pallidum	Congenital	Maternal screening is important since more than half of infants with congenital syphilis are asymptomatic
Varicella-zoster virus	Congenital or perinatal	Congenital infection leads to severe scarring and contractures. Perinatal transmission leads to severe primary varicella in the newborn with an associated mortality rate of 30%
West Nile virus	Congenital	Rare. Leads to severe neurologic damage
Zika virus	Congenital	Associated with severe microcephaly, blindness, deafness, neurodevelop-mental problems, and other congenital malformations

Contoso

Clinical manifestations of vertically transmitted infections by system

	Neurologic	Ophthalmologic	Skin	GI	Skeletal	Other
Congenital cytomegalovirus infection	Microcephaly, hydrocephalus, periventricular calcifications, seizures, hearing loss, hypotonia	Chorioretinitis, vision loss	"Blueberry muffin" rash with associated petechiae and/or purpura	Hepatosplenomegaly, hepatitis, jaundice	Osteitis	Intrauterine growth retardation, anemia, thrombocytopenia
Congenital toxoplasmosis	Microcephaly, hydrocephalus, intracranial calcifications (not typically periventricular) seizures, hearing loss	Chorioretinitis, strabismus, blindness	Maculopapular rash	Hepatosplenomegaly hepatitis, jaundice, hepatic calcifications		Intrauterine growth retardation, anemia, thrombocytopenia, pericarditis, pneumonitis, adenopathy
Congenital rubella syndrome	Microcephaly, hydrocephalus hearing loss, meningoencephalitis	Cataracts, glaucoma, retinopathy, microphthalmia	"Blueberry muffin" rash with associated petechiae and/or purpura	Hepatosplenomegaly, hepatitis, jaundice	Bony lucencies	Intrauterine growth retardation, anemia, thrombocytopenia, pneumonitis, congenital cardiac defects including patent ductus arteriosus, pulmonary artery stenosis, and coarctation of the aorta
Congenital syphilis	Meningitis, 8th nerve deafness (later, if untreated)	Chorioretinitis, glaucoma Interstitial keratitis (later, if untreated)	Maculopapular erythematous rash, turns coppery, involves palms and soles. Pemphigus syphiliticus-vesiculobullous lesions that rupture and macerate, petechiae	Hepatosplenomegaly hepatitis	Metaphysitis, periostitis, osteitis of the long bones. Later, if untreated: Saber shins, frontal bossing	Pneumonitis, anemia, snuffles (nasal discharge), lymphadenopathy Later, if untreated: Hutchinson teeth, mulberry molars, saddle nose deformity
Congenital varicella infection	Microcephaly, meningoencephalitis, seizures, cortical atrophy	Chorioretinitis, microphthalmia	Bullous lesions, hypopigmentation, scarring with disfiguring contractures		Limb hypoplasia, absent digits	Hydronephrosis and hydroureter
Perinatal varicella infection	Meningoencephalitis		Generalized vesicular rash, may be hemorrhagic			Pneumonia, viral sepsis. Associated with a 30% mortality rate
Congenital parvovirus B19 infection	Meningoencephalitis (very rare)					Intrauterine growth retardation, severe anemia, high-output heart failure with hydrops fetalis, thrombocytopenia
Perinatal herpes simplex virus infection	Meningoencephalitis, seizures, hypothermia, hearing loss	Keratitis, chorioretinitis, cataracts	Vesicles of the skin and mucous membranes	Hepatosplenomegaly, hepatitis, jaundice		Inspect skin at scalp electrode and circumcision sites for vesicles and ulcers
Congenital herpes simplex virus infection	Microcephaly	Chorioretinitis, cataracts		Fulminant hepatitis with hepatic failure		Viral sepsis, pneumonia
Congenital Zika virus infection	Severe microcephaly, ventriculomegaly, subcortical calcifications, abnormal tone, deafness, blindness	Macular scarring, cataracts, optic nerve atrophy, microphthalmia			Skull collapse, joint contractures	

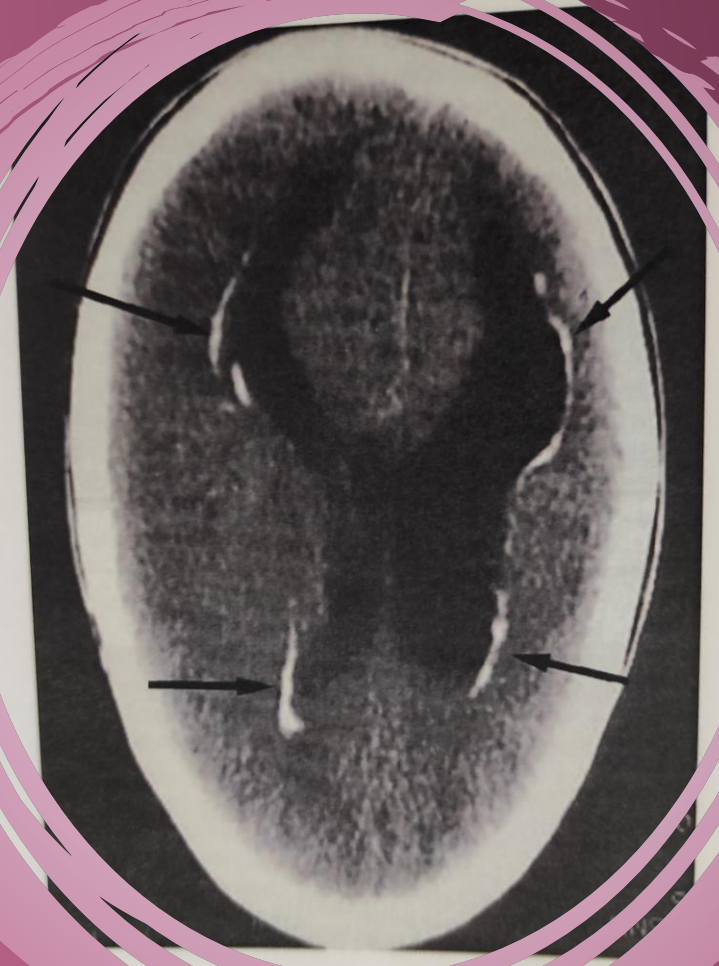
Perinatal infection with hepatitis B and C viruses, HTLV-1 and 2, and HIV is almost always asymptomatic at birth and during early infancy. Of these, perinatally acquired HIV infection is the only one likely to lead to clinical manifestations during the first year of life.

SHOWN IS A 20-DAY-OLD INFANT WHO DEVELOPED A CLUSTER OF VESICLES ON THE ABDOMEN 1 DAY AGO. A POLYMERASE CHAIN REACTION TEST PERFORMED ON FLUID THAT WAS COLLECTED BY UNROOFING ONE OF THE LESIONS WAS POSITIVE CONFIRMING THE SUSPECTED DIAGNOSIS OF PERINATAL HERPES SIMPLEX VIRUS INFECTION. (IMAGE PROVIDED BY DR. MAYSSA

SHOWN IS THE RIGHT HAND OF A 14-DAY-OLD INFANT WHO DEVELOPED A VESICULAR RASH STARTING ON DAY 11 OF LIFE. TESTING CONFIRMED THE DIAGNOSIS OF PERINATAL HERPES SIMPLEX VIRUS INFECTION. (IMAGE PROVIDED BY DR. DAVID CLARK)

THE TERM NEWBORN SHOWN HERE HAS THE TYPICAL FEATURES OF SEVERE CONGENITAL CYTOMEGALOVIRUS, INFECTION INCLUDING BEING SMALL FOR GESTATIONAL AGE, A GENERALIZED "BLUEBERRY MUFFIN" RASH, AND MASSIVE HEPATOSPLENOMEGALY. THE EDGES OF THE LIVER AND SPLEEN ARE PALPABLE WELL BELOW THE COSTAL MARGINS AS IDENTIFIED BY THE WHITE TAPE AND HIGHLIGHTED WITH ARROWS. (IMAGE PROVIDED BY DR. DAVID CLARK

COMPUTER TOMOGRAPHY SCANNING OF THE BRAIN OF AN INFANT WITH CONGENITAL.CYTOMEGALOVIRUS INFECTION. THE LATERAL VENTRICLES ARE DILATED, INDICATING THE PRESENCE OF HYDROCEPHALUS. THE LOCATION OF THE INTRACRANIAL CALCIFICATIONS, HIGHLIGHTED BY ARROWS, SHOWS THE CLASSIC PERIVENTRICULAR DISTRIBUTION PATTERN THAT IS SO TYPICAL FOR CONGENITAL CYTOMEGALOVIRUS INFECTION. (IMAGE PROVIDED BY DR. DAVID CLARK



THIS NEWBORN WAS INFECTED WITH VARICELLA-ZOSTER VIRUS WHILE IN UTERO. THE POX LESIONS ARE NOW GONE BUT ARE RESPONSIBLE FOR THE PARTIAL LOSS OF SEVERAL TOES, RESIDUAL SCARRING, AND LIMB CONTRACTURES. (IMAGE PROVIDED BY DR. DAVID CLARK

THIS INFANT HAS A CLASSIC BLUEBERRY MUFFIN RASH, THE SCATTERED, WIDESPREAD, RAISED PURPURIC LESIONS ARE SMALL ISLETS OF EXTRAMEDULLARY HEMATOPOIESIS. AS THE BONE MARROW RECOVERS OVER TIME, THE RASH FADES, A PROCESS THAT TAKES WEEKS TO MONTHS. (IMAGE PROVIDED BY

Diagnostic testing for vertically transmitted infections

Infection	Diagnostic tests to consider
Congenital toxoplasmosis	Serum IgG, IgM, and IgA from infant and mother Polymerase chain reaction testing of serum, urine, and/or cerebrospinal fluid Hepatic transaminases and bilirubin Complete blood count Neuroimaging
Congenital cytomegalovirus	Urine vial culture during the first 3 weeks of life Urine or saliva polymerase chain reaction testing Hepatic transaminases and bilirubin Complete blood count Neuroimaging
Perinatal herpes simplex virus infection	Polymerase chain reaction testing of blood Polymerase chain reaction testing of cerebrospinal fluid Polymerase chain reaction testing of conjunctivae, oropharynx, rectum, and any skin lesions present Viral culture from any of the above anatomic fluids or sites Hepatic transaminases and bilirubin Complete blood count Neuroimaging
Congenital rubella syndrome	Serum rubella IgM Serial testing of serum rubella IgG Throat or nasal polymerase chain reaction testing or viral culture Less commonly, polymerase chain reaction testing or viral culture of urine or cornea (cataract) Echocardiogram Hepatic transaminases and bilirubin Complete blood count Neuroimaging
Congenital or perinatal varicella infection	Polymerase chain reaction testing of vesicle fluid Direct fluorescent antibody testing of vesicle fluid Viral culture of vesicle fluid, with roll tube inoculation at the bedside Hepatic transaminases and bilirubin Neuroimaging if indicated
Congenital parvovirus B19 infection	Antenatal polymerase chain reaction testing on amniotic fluid Postnatal polymerase chain reaction testing on blood Serum parvovirus B19 IgM Complete blood count
Congenital Zika virus testing	Polymerase chain reaction testing on blood Polymerase chain reaction testing on urine Polymerase chain reaction testing on cerebrospinal fluid Serum Zika virus IgM Cerebrospinal fluid Zika virus IgM Neuroimaging
Congenital syphilis	Quantitative rapid plasma reagin on mother and infant Fluorescent treponemal antibody absorption (FTA-ABS) IgM test If available Fluorescent treponemal antibody absorption (FTA-ABS) IgG test To confirm maternal infection No useful diagnostically for the infant infant Venereal Disease Research Laboratory (VDRL) test of cerebrospinal fluid Hepatic transaminases and bilirubin Complete blood count Plain radiographs of the long bones Chest radiograph if indicated Serial quantitative rapid plasma reagin to verify treatment effectiveness

Available anti-infective treatments for vertically transmitted infections

Infection	Anti-infective treatment
Congenital toxoplasmosis	Pyrimethamine plus sulfadiazine plus folinic acid orally for 1 year
Congenital cytomegalovirus	Valganciclovir, orally for 6 months
Perinatal herpes simplex virus infection	Acyclovir Intravenous for 14 days for SEM disease Intravenous for 21 days for CNS disease Each followed by 6 months of oral suppression
Congenital rubella syndrome	None available Prevention is key. Maintain high rubella vaccination rates. Any woman found to be seronegative for rubella during pregnancy should be immunized immediately after delivery
Congenital syphilis	Aqueous penicillin G intravenous or procaine penicillin G intramuscular for 10 days Alternatively, benzathine penicillin G intramuscular as a single dose under low-risk circumstances
Congenital or perinatal varicella infection	Acyclovir, intravenous Prevention is key. Maintain high varicella vaccination rates. Varicella-zoster immune globulin should be administered to newborns exposed to maternal varicella 5 days before or 2 days after delivery
Congenital parvovirus B19 infection	No antiviral medications are available. Support using in utero and/or postnatal red blood cell transfusions can be life-saving
Congenital Zika virus infection	None available

Contoso

جدول ۱-۲. واکسیناسیون در بارداری

واکسن	ممنوع در بارداری	قابل تزریق در موارد خاص	توصیه‌شده
هپاتیت A		●	
هپاتیت B		●	
مننگوکوک		●	
پنوموکوک		●	
پاپیلومای انسانی	●		
آنفلوانزا (inactivated)			●
آنفلونزای زنده داخل بینی	●		
سرخک، سرخجه، اوریون	●		
Tdap			●
Td (در ایران)			●
واریسلا	●		

THANK YOU