50 1972 - 2022
Years Of Excellence

GLOBAL RESEARCHER
CLUB

MATERNAL AND CHILD HEALTH

By the Global Researcher Club &
Alamein College of Pharmacy

About Us

The Global Researcher Club

Global Researcher Club® is an international voluntary & non-profit scientific research community for researchers worldwide. GRC® was established in August 2022 in Alexandria, Egypt, by Dr. Ramy Ghazy and Dr. Assem Gebreal. The club's origins can be traced back to September 2020, when it started as an informal group for scientists and students. Over time, the group grew in membership and scope, leading to the establishment of GRC® as a global research community.

The Global Researcher Club's vision is to establish a worldwide research community that has a constructive effect on the world by promoting research and youth to address pressing health challenges and enhance the health and well-being of people everywhere. The organization is dedicated to creating a world where research is accessible to everyone and researchers are empowered to positively impact society.
We are committed to fostering excellence, integrity, and social responsibility in research, transcending geographical, disciplinary, and cultural boundaries, and becoming a leading voice and catalyst for change in the global research landscape. We strive to promote diversity, equity, and inclusion.

GLOBAL RESEARCHER
CLUB

info@globalresearcherclub.org

https://globalresearcherclub.org

Alamein College of Pharmacy

The College of Pharmacy at the Arab Academy for Science, Technology, and Maritime Transport, Alamein Branch, was established in 2019. Classes at the college began in September 2019. The college is accredited by ACPE. It offers a Pharm D degree after five years of study and one year of practical training.

The college consists of three sectors:

- Pharmaceutical Sciences Sector
- Clinical and Biological Sciences Sector
- Pharmacy Practice Sector

The college is equipped with the necessary facilities for the educational process, including simulation systems, the Body Interact device, and advanced laboratories. Additionally, there is a central laboratory for pharmaceutical analysis. The college engages in numerous research activities in the field of pharmacy through its faculty members and students, in collaboration with other disciplines within the academy.

Given its location in Alamein, a remote and newly established city, the college actively participates in various community activities within the governorate.

Authors

Merna Moharam, Fatima Asim, Jomana Hashem, Bernadit Michael, Maha Khattab, Assem Gebreal and Yousra El-Maradny.

Table of contents

Introduction

Maternal infections are an important cause of maternal mortality and severe maternal morbidity. Infections during pregnancy can be associated with adverse pregnancy outcomes such as stillbirth, preterm birth, low birth weight, and spontaneous abortion.

With appropriate prevention, diagnosis, and treatment of infections during pregnancy, we can reduce maternal and neonatal morbidity and mortality and mitigate the adverse effects of maternal infections on both mothers and newborns.

Maternal to child transmission of infections

Mother-to-baby transmission of infections can occur:

- In Utero (congenital).
- During Delivery (perinatal).
- During Breastfeeding (postnatal).

Maternal infections can spread to the embryo and fetus by:

- Infections ascend from the upper vagina via the uterine cervix to the amniotic fluid.
- Hematogenous spread as a result of maternal viremia, bacteremia, or parasitemia.

Effects of infections on pregnant woman

Many symptoms such as nausea, fatigue, vague myalgia, and physiologic leukocytosis are normally associated with pregnancy. A number of viral infections may manifest with similar symptoms and are likely to be ignored.

Some infections may cause severe problems for the fetus but minimal symptoms in the mother, such as cytomegalovirus infection and toxoplasmosis cause symptoms similar to the common cold in the mother. Due to pregnancy, a woman may be more frequently or more severely affected by certain disease processes.

Effects of maternal infections on fetus and newborn

- **Low birth weight**, birth weight of live born infant of less than 2500g (5 pounds 8 ounces).

- **Preterm birth** is defined as the birth of a live infant at less than 37 weeks gestation, which may happen with several viral, bacterial, and protozoan infections.

- **Abortion and stillbirth**, which may happen with infections crossing the placenta, such as rubella, syphilis, malaria, and herpes simplex virus.

- **Development anomalies**, such as central nervous system and cardiovascular abnormalities, deafness, and mental retardation may happen with some infections.

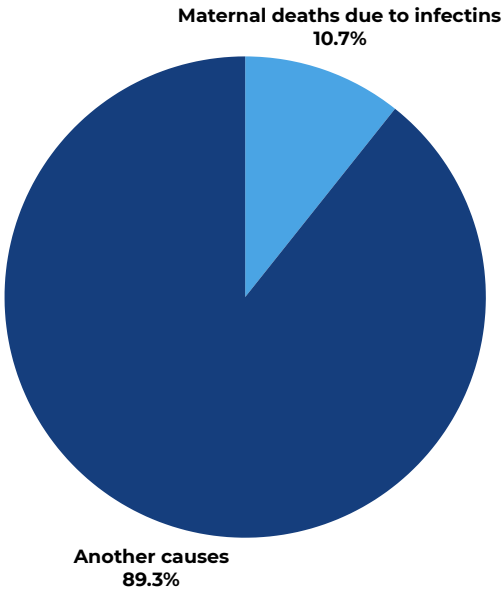
- **Postnatal persistence of infections**, some infections like *Mycobacterium tuberculosis*, *Treponema pallidum*, and malaria may survive for months and years in infants.

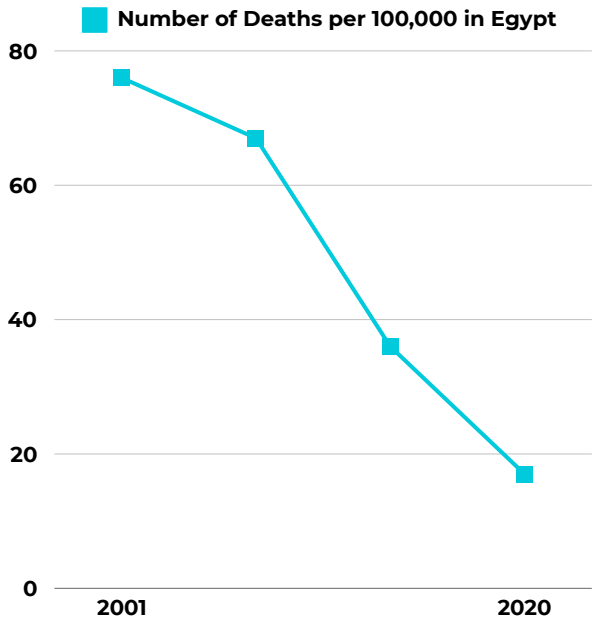
Statistics and Prevalence

Maternal mortality rate

Global estimates suggest that direct infections are the third most common cause of maternal mortality with the largest toll estimated in low-income and middle-income countries compared with high-income countries.
The contribution of infections to maternal deaths could be larger, as these do not include deaths due to abortion-related infections or indirect (non-obstetric) infections, which are not a result of but aggravated by pregnancy.

The **global** maternal mortality ratio in 2020 was 223 per 100,000 live births. Between 2001 and 2020, the maternal mortality ratio in **Egypt** declined at a moderating rate shrinking from 76 deaths per 100,000 live births in 2001 to 17 deaths per 100,000 live births in 2020.





Neonatal mortality rate

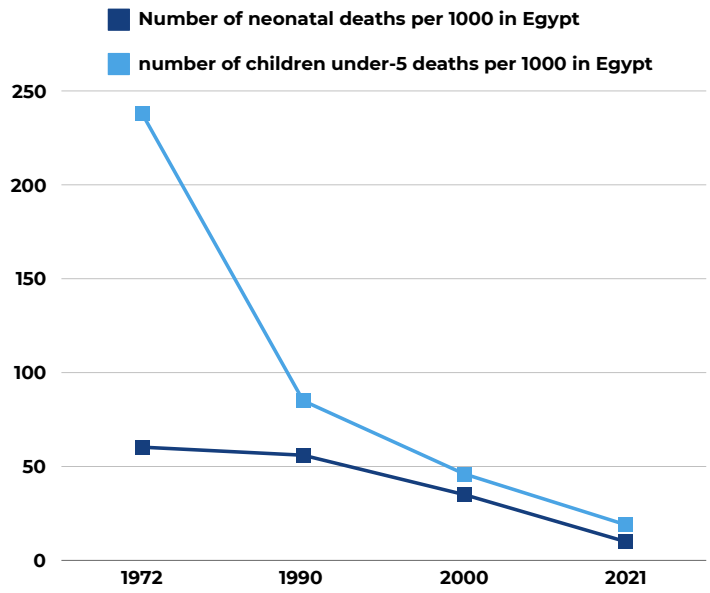
Globally 2.3 million children died in the first 20 days of life in 2022. There are approximately 6500 newborn deaths every day.
Since 1990, the global mortality rate has dropped by 59%, from 93 deaths per 1000 live births in 1990 to 38 in 2021.

Between 1972 and 2021, the neonatal mortality rate in **Egypt** declined at a moderating rate shrinking from 60.3 deaths per 1,000 live births in 1972 to 10 deaths per 1,000 live births in 2021.

Children under 5 mortality rate

In 2022, 4.9 million children under 5 years of age died. The **global** under-five mortality rate declined by 60%, from 93 deaths per 1,000 live births in 1990 to 37 in 2022.

Despite this considerable progress, improving child survival remains a matter of urgent concern.
In 2021, the child mortality rate in **Egypt** was 19 deaths per 1,000 live births. The child mortality rate in Egypt fell gradually from 238.1 deaths per 1,000 live births in 1972 to 19 deaths per 1,000 live births in 2021.



Impact of Maternal and Child Health Problems on Families and Communities

Families

- Increase financial strain from healthcare expenses.
- Emotional stress and mental health issues for parents, coping with maternal health complications.
- A higher risk of intergenerational poverty as children's health problems can limit their future opportunities.

Communities

- Reduced productivity due to caregiving responsibilities, particularly women, may need to take time off work to care for sick family members.
- Impact on community cohesion as families struggle with health issues, potentially leading to social isolation.
- Economic burdens from lost productivity and healthcare costs. Exacerbation of inequalities, especially in marginalized communities.

Addressing these impacts requires comprehensive healthcare policies, social support systems, and investments in education and economic opportunities, especially for women and children.

Infectious Diseases that Pose a Threat to Maternal and Child Health

HIV/AIDS

HIV stands for **human immunodeficiency virus**. **HIV** is a virus that attacks the body's immune system. Once **HIV** is in your blood, it controls and kills CD4 cells. These cells help your immune system fight disease.

Without treatment, women living with **HIV** are more susceptible to malaria, tuberculosis, herpes zoster, oral candidiasis, and cervical cancer. They are also vulnerable to severe illnesses rarely seen in healthy individuals, such as cryptococcal meningitis, toxoplasmosis encephalitis, and certain cancers including CNS lymphomas.

Evidence suggests that pregnancy and the postpartum period are

Clinical Presentation of HIV

- Acute **HIV** infection: "flu-like"
- Chronic HIV infection: Most patients are asymptomatic.
- AIDS: CD4 cell count less than 200

Transmission of HIV

- Unprotected sex with an infected partner.
- Transfusion with contaminated blood.
- Injection with contaminated needles.
- Body fluids that can contain **HIV** include:
  Blood, Breast milk, Semen fluid, Vaginal fluids, Rectal fluids
- From infected mother to child during pregnancy, delivery, or during breastfeeding.

Screening and diagnosis

HIV testing can be accurately performed with rapid test kits using finger-stick blood samples in either facility or community settings.
Standard testing may not detect infection during the "**window period**" (up to 3 to 12 weeks after infection) when the body is producing antibodies to **HIV**.
Therefore, women should be educated about the signs and symptoms of acute **HIV** infection and should be retested every three months during pregnancy and breastfeeding.

Treatment of HIV

Treatment dramatically decreases the likelihood that **HIV** will be transmitted to uninfected partners and babies

- **HIV** replication is suppressed by combination antiretroviral therapy (ART) consisting of three or more drugs. The simplest regimen is a fixed dose that can be taken as a single daily tablet

.

- Prevention of opportunistic infections with a daily dose of 960 mg co-trimoxizole preventative therapy (CPT) is also recommended for HIV-infected individuals, including pregnant and breastfeeding women with a CD4 count of less than 350.

Tuberculosis (TB)

Tuberculosis (TB) poses a serious threat to the lives and health of pregnant women and their infants but is often not recognized during pregnancy and the postpartum period. **TB** disease and risk for TB progression must be recognized and treated, to protect the health of the mother and infant. There are many potential reasons for this increased risk, including immune system changes in a woman's body during pregnancy, nutritional stress, and hormonal changes.

TB usually affects the lungs (pulmonary TB) but can affect other sites also (extrapulmonary TB).

Clinical Presentation of TB

The masking of symptoms by what are believed to be pregnancy-related symptoms.

- Persistent and lengthy coughing that lasts more than three weeks
- Loss of appetite and unintentional weight loss
- Fever and Chills
- Night sweats.
- A general sense of feeling unwell.

Transmission of TB

TB-causing bacteria spread through the air from one person to another

- Individuals at increased risk are those exposed to **TB** disease with poor ventilation
- Those who are immune impaired due to substance abuse, poor nutritional status, systemic disease

Pregnant women with HIV have 10 times the risk of developing active TB.

Screening and diagnosis

There are two kinds of tests used for screening of TB:
The **TB skin test (TST)** and **TB blood tests**. A positive TB skin test or TB blood test only tells that a person has been infected with TB bacteria. It does not tell whether the person has latent TB infection (LTBI) or has progressed to TB disease. Symptom screening for TB is most appropriate in settings with high incidence of TB or high HIV coinfection rates.

Treatment of TB

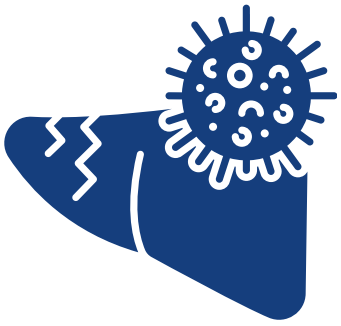
The same six-month TB treatment regimen for pregnant and non-pregnant:
Ethambutol, isoniazid, rifampicin, and pyrazinamide for two months, then isoniazid, and rifampicin for an additional four months. With the exception of streptomycin, which is used in retreatment and is ototoxic to fetuses.

Hepatitis B (HBV)

Hepatitis is an inflammation of the liver and caused by viral infections. The most common virus strains are hepatitis A, B, C, D, and E. Hepatitis B and C are of public health importance because they are transmitted vertically from mother to fetus.

Babies born to a mother with **hepatitis B virus (HBV)** infection have a greater than 90% chance of developing chronic hepatitis B if they are not properly treated at birth. Pregnant women must know their hepatitis B status to prevent passing the virus on to their newborn baby during delivery.

Clinical Presentation of HBV



- Dark urine
- Nausea and vomiting
- Fever
- Weakness and fatigue
- Loss of appetite
- Joint pain
- Yellowing of the skin and the whites of the eyes (jaundice)

Transmission of HBV

- Vertical transmission from mother to child during pregnancy or at birth.
- **HBV** can also be transmitted sexually.
- Parenterally (blood-to-blood, contaminated needles, or transfusion).

Screening and diagnosis

- All pregnant women should be screened for **HBV** by testing for the Hepatitis B surface antigen (HBsAg).
- If universal screening is not possible, priority should be given to those with an increased risk of HBV (people with HIV, people who have received blood transfusions or organs, and infants born to infected mothers).
- If the HBsAg is positive, testing is needed to determine acute or chronic infection and the infant should receive **HBV** vaccine and Hepatitis B Ig.
- For pregnant women diagnosed with **HBV**, the severity of the disease should ideally be assessed with laboratory investigations including liver biochemical tests and coagulation studies, as well as imaging studies.

Treatment of HBV

- The goal of treatment is to prevent the progression of the disease.
- Supportive care and nutritional support should be provided.
- Effective medications to treat chronic **HBV** include **pegylated interferon alfa, entecavir, and tenofovir.**

Malaria

Ninety percent of **malaria** deaths occur in Africa and disproportionately affect pregnant women and young children. Approximately 125 million pregnancies occur each year in areas with *Plasmodium falciparum* and/or *P. vivax* malaria transmission; 10,000 of these women and 200,000 of their newborns will die as a result of malaria during pregnancy. Malaria in pregnancy (MIP) contributes to maternal anemia, maternal death, stillbirth, spontaneous abortion, and low birth weight.

Clinical Presentation of Malaria

- Fever and Chills.
- General feeling of discomfort.
- Headache.
- Nausea and vomiting.
- Diarrhea and Abdominal pain.
- Muscle or joint pain.

Transmission of Malaria

- By the bite of an infected female Anopheles mosquito.
- **Malaria** may also be spread by transfusion of blood from infected people or by the use of contaminated needles or syringes.
- People with untreated or inadequately treated malaria may spread infection to a mosquito that bites them.

Screening and diagnosis

- Routine screening for **malaria** in pregnancy is not recommended in stable malaria transmission areas since it is expected that pregnant women will receive intermittent preventive treatment in pregnancy with Sulfadoxine-Pyrimethamine (IPTp-SP) during routine antenatal care (ANC).
- For women with malaria symptoms, parasitemia confirmation should be performed either by microscopy or rapid diagnostic testing.
- If a pregnant woman living in a **malaria** region has fever, headaches, or convulsions and malaria cannot be excluded, it is essential to treat the woman for both malaria and eclampsia

Treatment of Malaria

- Pregnant women living in areas of high to moderate **malaria** transmission should receive intermittent preventive treatment with 3 tablets of sulfadoxine 500 mg/ pyrimethamine 25 mg (IPTp-SP) at every ANC visit beginning as early as possible in the second trimester IPTp-SP should be administered as directly observed therapy (DOT).

- The WHO recommends artemisinin-based combination therapies (ACTs) for the treatment of uncomplicated *P. falciparum* malaria in the second and third trimesters. ACT is safe in pregnancy, and the choice of ACT should be based on treatment efficacy against local strains of *P. falciparum* malaria.

- For uncomplicated **malaria** in pregnancy in the first trimester, oral quinine plus clindamycin should be given for seven days.

- Women who are breastfeeding should receive recommended antimalarial treatments, except for primaquine and tetracycline.

Toxoplasmosis

Screening and diagnosis

- *Toxoplasma gondii* infection can be diagnosed using serologic tests, ultrasound scans, and amniocentesis.
- Results of serologic tests measuring immunoglobulin (Ig) M and IgG are often difficult to interpret when differentiating between acute and chronic infections.
- Following acute infection, IgM antibody titers rise starting on day 5 and reach the maximum level at 1 to 2 months. At this point, IgM antibodies decline more rapidly than IgG antibodies. In contrast, IgG antibodies are usually detectable within 1 to 2 weeks after acute infection, peak within 12 weeks to 6 months, and usually remain detectable throughout life. The absence of IgG and IgM antibodies before or early in pregnancy indicates no previous infection and identifies women at risk of acquiring the infection during pregnancy.
- The detection of IgG antibodies and the absence of IgM antibodies indicates an old infection.
- If an acute infection is suspected, repeat testing is recommended within 2 to 3 weeks. A 4-fold rise in IgG antibody titer between tests indicates a recent infection.

Treatment of Toxoplasmosis

- If primary *T. gondii* infection is confirmed during pregnancy, treatment is used for fetal prophylaxis or to decrease the disease severity.
- In case of maternal infection without fetal infection, spiramycin is the drug of choice to prevent vertical transmission.
- Spiramycin is a macrolide antibiotic that cannot cross the placenta but remains concentrated in it.

Chrorioamnionitis and Puerperal Infection

Infection of the amniotic fluid or membranes, or chorioamnionitis, can develop during labor when cervical or vaginal microorganisms migrate through the cervical canal during prolonged labor or prolonged rupture of membranes

Clinical Presentation

- Fever
- Uterine fundal tenderness
- Maternal tachycardia (>100/min) and fetal tachycardia (>160/min) Purulent or foul odor of amniotic fluid

Screening and diagnosis

- Maternal fever with two of the following: maternal tachycardia, fetal tachycardia, uterine tenderness, foul odor of amniotic fluid, or leukocytosis.
- Needle aspiration and analysis of amniotic fluid (amniocentesis) is the only invasive procedure used to confirm the diagnosis of acute chorioamnionitis. This procedure can be risky with intact fetal membranes because the fetal membranes can rupture during or after the procedure.

Treatment

- Treatment with broad-spectrum antibiotics is essential.
- Give fluids rapidly as well as a combination of IV ampicillin 2 g every 6 hours, gentamicin 5mg every eight hours, and metronidazole 500 mg every 8 hours.

Prevention and Control

Infections in pregnancy are preventable. Taking small, every day precautions can go a long way in reducing possible harm to you and your baby.

1. Maintain good hygiene

Keeping your hands clean is one of the best ways to remove germs and prevent the spread of infection. Hands should be wet with water and antimicrobial soap and then rubbed together for at least 20 seconds.

Pay special attention to fingernails, between the fingers, and the wrists. Rinse the hands thoroughly and dry with a single-use towel.

2. Prepare/handle food carefully

Undercooked meats and processed meats might contain harmful bacteria.

- Wash hands before and after handling food.
- Be sure temperature controls in refrigerators and freezers are working properly.
- Wash counters, cutting boards, and utensils especially after preparing eggs, poultry, or other meats.
- Cook meat, poultry, and eggs thoroughly.
- Using a meat thermometer is the best way to ensure that food is thoroughly cooked.

3. Folic acid supplements

Get 400 micrograms (mcg) of folic acid every day. Folic acid is a B vitamin. If a woman has enough folic acid in her body at least one month before and during pregnancy, it can help prevent major birth defects in the developing brain and spine. Women can get folic acid from fortified foods or supplements, or a combination of the two, in addition to a varied diet rich in folate.

4. Avoid people who have an infection

This is especially true for infections like chickenpox or rubella. Chickenpox can cause pregnancy complications and birth defects; rubella can cause serious birth defects and put you at risk for miscarriage or stillbirth. Stay away from anyone who has these infections and stay up to date on vaccines before and during pregnancy.

5. Avoid insect bites

Mosquito bites can be prevented by wearing protective clothing and using screens or netting in areas inhabited by mosquitoes.
Use of DEET-based insect repellents. DEET is the most effective insect repellent currently available and has an excellent safety record. Pregnant and breastfeeding people can use DEET.

6. Avoid travel to high-risk locations

If you plan to travel during pregnancy, it's a good idea to consult with a travel clinic about infection issues for your planned destination.
Stay alert to disease threats when you travel or visit underdeveloped countries and get all recommended traveler's immunizations.
Use protective medications for travel, especially to areas with malaria.

7. Avoid changing cat litter and stay away from wild or pet rodents

Do not touch or change dirty cat litter and avoid contact with potentially contaminated soil. If you must change the litter yourself, be sure to wear gloves and wash your hands afterward.
Stay away from wild or pet rodents, lizards, and turtles and if you have a pet rodent, have someone else care for it until after your baby arrives.

8. Get tested for sexually transmitted diseases (STDs)

It's important to know if you have an STI when you're pregnant. Protect yourself from sexually transmitted diseases such as HIV and HBV by using safer sex practices and getting tested. Some people who have STIs do not feel sick or have any symptoms.

9. See a healthcare professional regularly

You should see your doctor when planning a pregnancy and start prenatal care.

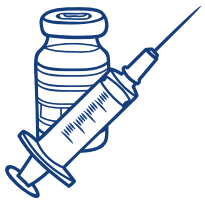
Talk to a healthcare provider about taking any medications. We know that certain medications can cause serious birth defects if they are taken during pregnancy. If you were pregnant, you should not stop taking medications or begin taking new medications without first talking with your healthcare provider. This includes prescription, over-the-counter medications, and dietary or herbal products. Never self-medicate with antibiotics or share them with family or friends.

10. Vaccination

It’s important to be up-to-date on your immunizations before getting pregnant. Most vaccinations are safe during pregnancy and some vaccinations, such as the influenza, hepatitis B, and the Tdap vaccine, are specifically recommended during pregnancy.

Other people living in your household, including children, should also be up to date with their immunizations; this decreases your risk of exposure to infections during pregnancy as well as your and your baby's risks of exposure to infection after birth.

Vaccines and Immunization



Immunization is the process of protecting a person from a specific disease.

Types:

- **Active**: Vaccine which acts in place of natural antigen
- **Passive**: Ready-made antibodies, our body does not take in the making.

Vaccination is a simple, safe, and effective way of protecting you against harmful diseases before you come into contact with them. It uses your body's natural defenses to build resistance to specific infections.

VACCINATION AGAINST MATERNAL INFECTIONS

Owing to physiologic and immunologic changes that support pregnancy and tolerance of a semi-allogenic fetus, pregnant women demonstrate increased susceptibility to certain infectious agents

Vaccines Recommended for Use in Pregnancy:

- **Influenza:**

Immunization is the best strategy for flu prevention as supported by the current CDC recommendation that all pregnant women receive inactivated influenza vaccine (IIV) during flu season.

- **Tetanus, Diphtheria, and Pertussis:**

This is also called Tdap. One dose of the Tdap vaccine is recommended during each pregnancy. Tdap vaccine helps protect your newborn from whooping cough. Aim to get the vaccine between 27 and 36 weeks of pregnancy.

- **COVID-19 vaccine:**

An updated COVID-19 vaccine is recommended and safe in pregnancy. Studies have shown COVID-19 vaccines don't pose any serious risks for people who are pregnant or their babies.

- **Hepatitis B vaccine:**

The hepatitis B vaccine is recommended for those who are at risk of acquiring hepatitis B during pregnancy.

- **Respiratory syncytial virus (RSV):**

There are two ways to prevent RSV in newborns. One way is for the pregnant person to get an RSV vaccine between 32 and 36 weeks of pregnancy. The other way is to give the baby a shot after birth.

Vaccination Against Neonatal and Infant Infections

Owing to the limited exposure to foreign antigens and blunted innate immune responses in utero, the neonatal immune system is immature at birth, making neonates particularly susceptible to infections. Vaccines will help protect your child against diseases that can cause serious harm or death.

Different vaccines work in different ways, but every vaccine helps the body's immune system learn how to fight germs. It typically takes a few weeks for protection to develop after vaccination, but that protection can last a lifetime.

Immunization schedule

Age	Vaccine	Dosage
At first 24 hours	Hepatitis B vaccine	First dose, 0.5 ml, IM
After birth	BCG	0.1 ml, intradermally,
		no tuberculin
Two months	Sabin, OPV	First dose, three drops on the tongue.
	Diphtheria, Pertussis, and Tetanus (DPT)	First dose, 0.5 ml, deep SC or IM
	Hepatitis B vaccine	First dose, 0.5 ml, IM
Four months	Sabin, OPV	Second dose, three drops on the tongue
	Salk DPT	First Salk, 2nd DPT, 0.5 ml, IM
	Hepatitis B vaccine	Second dose, 0.5 ml, IM
Six months	Sabin, OPV	Third dose, three drops on the tongue
	Salk DPT	Second Salk, 3rd DPT, 0.5 ml
	Hepatitis B vaccine	Third dose, 0.5 ml, IM
Nine months	Sabin, OPV	Booster dose, three drops on the tongue
12 months	Sabin, OPV	Booster dose, three drops on the tongue
	Measles, Mumps, and Rubella	One dose, 0.5 ml, SC
18 months	Sabin, OPV	Booster dose, 0.5 ml, deep SC or IM
	DPT	Booster dose, 0.5 ml, deep SC or IM
	Measles, Mumps, and Rubella (MMR) vaccine	one dose, 0.5 ml SC

Expanded Programme on Immunization

The Expanded Programme of Immunization (EPI) is a priority program for Egypt due to its cost-effective ability to save lives. EPI in Egypt has achieved several successes in controlling vaccine-preventable diseases, including strong national vaccination coverage of over 90%, through an increase of vaccine coverage and continuous surveillance leading to reduced illness, disability, and death from diseases such as diphtheria, tetanus, whooping cough, measles, and polio.

With high coverage rates for routine immunization, vaccine-preventable diseases have shown a remarkable decline in past decades. However, several factors indicate that there are still challenges, with measles outbreaks occurring in 2013 and 2014, and an increasing need for funding for new vaccine introduction.

Conclusion

Infectious diseases pose significant risks to maternal and child health, underscoring the importance of preventive measures and timely interventions. Vaccination programs, prenatal care, and access to essential healthcare services play pivotal roles in safeguarding mothers and children from infectious diseases. Moreover, community education and the promotion of healthy behaviors are crucial for reducing the burden of infectious diseases on maternal and child health. By prioritizing comprehensive strategies that address both maternal and child health needs, we can work towards healthier outcomes for families and communities worldwide.

References

1. Infectious Diseases and Maternal Morbidity and Mortality. Finnegan, L. P., Sheffield, J., Sanghvi, H., & Anker, M.
[Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3329032/]

2. The global burden and trends of maternal sepsis and other maternal infections in 204 countries and territories from 1990 to 2019. BMC Infectious Diseases (2021, October 18). [Available from: https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-021-06779-0]

3. Prevalence of Maternal mortality. UNICEF Data. [Available from: https://data.unicef.org/topic/maternal-health/maternal-mortality/]

4. Prevalence of Under-five mortality. UNICEF Data. [Available from: https://data.unicef.org/topic/child-survival/under-five-mortality/]

5. Infections and Pregnancy: Effects on Maternal and Child Health. Kumar, M., Saadaoui, M., & Al Khodor, S. Frontiers in Cellular and Infection Microbiology.
[Available from: https://www.ncbi.nlm.nih.gov/pmc/articles-/PMC9217740/]

6. Health and Infectious Diseases: A Technical Update. United States Agency for International Development (USAID).
[Avaliable from: U.S. Agency for International Development (.gov) https://pdf.usaid.gov › pdf_Maternal Health and Infectious Diseases]

7. Steps to Prevent Infections During Pregnancy. American Academy of Pediatrics Section on Infectious Diseases (2024, February 15).
[Available from: https://www.healthychildren.org/prenatal/Pages/Simple-Steps-to-Prevent-Infections-During-Pregnancy.]

8. Infections in Pregnancy by Kristeen Cherney. Healthline (2016, March 29).
[Available from: https://www.healthline.com/health/pregnancy/infections]

9. Vaccinations in pregnancy. NHS (2023, January 18).
[Available from: https://www.nhs.uk/pregnancy/keeping-well/vaccinations/]

10. Vaccines and routine immunization. UNICEF.
[Available from: https://www.unicef.org/egypt/vaccines]

11. Expanded programme on immunization. WHO.
[Available from: https://www.emro.who.int/egy/programmes/expanded-programme-on-immunization.html]

follow us for more

www.globalresearcherclub.org