

Maternal Education: Immunization during Pregnancy

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1. Introduction

Pregnancy is especially vulnerable days for mother and her unborn fetus from contagious diseases. Some of contagious diseases can cause serious problem to mother and her unborn fetus. Pregnancy period are at high risk from infectious diseases, they need to up-to-date with their immunization before the conception and all mother should get influenza and pertussis vaccines during every pregnancy. Some of the vaccine can save various infectious or contagious diseases like influenza, hepatitis A, hepatitis B, Meningococcal, pneumococcal disease, measles, mumps, rubella, diphtheria, tetanus and whooping cough.

2. Risk of infectious/ contagious diseases during Pregnancy

If pregnant mother become infected with infectious diseases can harm to her unborn fetus. Baby may harm if mother is infected during pregnancy.

a. Influenza:

Influenza may cause severe illness in pregnant mother than in mother who are not pregnant. It affects the cells, tissues, organs, heart and lungs during pregnancy & up to two weeks postpartum. Pregnant mother with influenza virus have a higher risk for serious problems for their developing womb, may have premature labor and delivery.

In India, 33,761 cases reported flu and 2035 death as on March 2015. The states of Rajasthan and Gujarat are the worst affected. During December 2014 to May 2015, 266 North Indian pregnant women have febrile ARI, out of 50 (18.8%) women tested positive for influenza (A/H1N1pdm09 in 41, A/H3N2 in 8, and influenza B Yamagata in 1). The complaints of pregnant mother were Rigors, headache and a family history of ARI. 9 influenza positive cases needed hospitalization for their respiratory illness and 5 developed respiratory failure, among 4 (3 in third trimester) death. Their study concludes that influenza viruses are a cause of significant morbidity and mortality among pregnant women with ARI in North India. Influenza infection may adverse outcome of abortion, preterm birth or stillbirth, death of mother and fetal demise.

b. Tdap (Tetanus, diphtheria and pertussis):

Neonatal tetanus may happen in newborn, which have low levels of anti-tetanus antibody due to a lack of passively transferred maternal antibody. Tetanus kills about 1 out of 5 people who are infected. Pertussis can cause

encephalopathy, pneumonia, seizures and the death of the fetus.

c. Hepatitis A:

Hepatitis A is a disease that cause liver problem but rarely in fatal. During pregnancy, this disease can be associated with a higher risk of preterm labor, especially if disease occurs during the 2nd or 3rd trimester. Other increased risks associated this infection may have premature Labor contractions, abruption placenta and premature rupture of membranes.

d. Hepatitis B

Approximately 400 million people are chronically infected with hepatitis B virus (HBV) worldwide and almost half have acquired their infections either through mother to infant transmission or in early childhood, especially in countries where hepatitis B virus has intermediate to high prevalence. In Asia, 8%–10% of the population is chronically infected with hepatitis B virus, and up to 50% of new cases of hepatitis B infection are due to mother to infant transmission. It can cause acute hepatitis B infection and can be passed on to the baby during birth and both mother and baby have the potential to become 'carriers' of hepatitis B. During September 2004 to December 2008 the prevalence of HBsAg positivity among asymptomatic pregnant women in North India is 1.1% with 71% having high HBV DNA levels. These women may have a high risk of transmitting infection to their newborns.

e. Meningococcal bacteria:

Meningococcal bacteria cause meningitis and septicemia. It can spread when someone with the infection coughs or sneezes. Meningitis is a serious disease, can cause long-term damage to the brain and nervous system and can even be fatal. The bacteria have several strains. Unvaccinated pregnant mother with risk factors for meningococcal disease should be vaccinated. Meningococcal bacteria have repeatedly caused outbreaks worldwide. There has been sudden surge of cases of meningococcal and meningococemia meningitis in early 2005 in Delhi, Uttar Pradesh and Haryana, India. In 17th July 2005, 429 probable cases of meningococcal disease have been reported in Delhi out of which 128 cases have revealed microbiological evidence of *Neisseria meningitidis*

f. Pneumococcal bacteria:

Pneumococcal bacteria are Gram positive lanceolate diplococci can cause pneumonia, otitis media, sinusitis, bronchitis and meningitis. Pneumococcal bacteria can be a

resident vaginal flora especially in women with predisposing factors. Women with high risk of Pneumococcal infection should be screened and vaccinated to reduce morbidity and mortality outcome for both mother and child. Maternal carriage or neonatal colonization should be aggressively treated to prevent materno fetal complications.

g. MMR (measles, mumps, rubella):

Mumps despite being a widely prevalent disease since most people are vaccinated against it as part of the MMR vaccine. In recent years 4,500 to 13,000 cases of mumps have been reported per year in the United States. The occurrence rate of mumps infection during pregnancy is 1:1000 pregnancies. Luckily, mumps during pregnancy has not been associated with an increased risk of premature delivery or birth defects. But mumps during the first trimester may increase the risk of miscarriage.

The measles virus is one of the most contagious agents ever known that causes human disease. Measles is a virus that can cause blindness, encephalitis, severe diarrhea and dehydration, ear infections and pneumonia. Measles virus during pregnancy may increases the risk of miscarriage, premature birth or stillbirth

Rubella infection is widespread in the communities over India. Rubella disease is a mild viral infection affecting both children as well as adults in both the sexes. Rubella infection in a susceptible (non-immune) woman during the months of pregnancy can lead to congenital rubella syndrome in the neonate. The occurrence of congenital anomalies is as high as 85% if maternal infection occurs during the first 12 weeks of gestation, 54% if infection occurs during weeks 13–16, and 25% if infection occurs at the end of the second trimester. When rubella infection occurs during the first trimester of pregnancy, it affects the embryo in utero that can cause fetal death in the form of spontaneous abortions and stillbirth. A child can be born with serious congenital anomalies like congenital cataract, glaucoma, cardiac defects, deafness, hepatosplenomegaly, hematological disorder, microcephaly and mental retardation. This can lead to severe lifelong disabilities in the child known as congenital rubella syndrome, causing a huge socioeconomic burden to the family in particular and the society in general.

h. Human papilloma virus (HPV):

Human papilloma virus (HPV) infection is one of cause of cervical cancer and there is growing evidence of HPV being a relevant factor in other anogenital cancers (anus, vulva, vagina and penis) as well as head and neck cancers. About 122,844 new cervical cancer cases are diagnosed annually in India. Cervical cancer is the 2th most common female cancer in women aged 15 to 44 years in India. About 67,477 cervical cancer deaths occur annually in India (estimations for 2012).

i. Varicella (chickenpox)

Varicella is a highly contagious viral illness that causes an itchy, blister-like rash and both mother and fetus might face serious health risks. If Varicella develops during pregnancy, mother may have pneumonia, but develops between 8th and 20th weeks; the newborn faces a slight risk of serious birth defects known as congenital varicella syndrome. Newborn

might develop skin scarring, underdeveloped arms and legs, inflammation of the eyes, and incomplete brain development. If Varicella occurs during the few days before deliver to 48 hours postpartum, the baby might be born with a potentially life-threatening infection called *neonatal Varicella*.

3. Recommended Vaccines of Before, during and After Pregnancy

Vaccine	Before pregnancy	During Pregnancy	After Pregnancy
Influenza	yes	Yes, during flu season	yes
Tdap	May be recommended	yes	yes
Hepatitis A	May be recommended	May be recommended	May be recommended
Hepatitis B	May be recommended	May be recommended	May be recommended
Meningococcal	May be recommended	Base decision on risk vs. benefit	May be recommended
Pneumococcal	May be recommended	Base decision on risk vs. benefit	May be recommended
HPV	May be recommended	No	May be recommended
MMR	May be recommended	No	May be recommended
Varicella	May be recommended	No	May be recommended

4. Influenza

Pregnant mother are at especially high risk of developing complications of the influenza. Vaccine against the seasonal flu is recommended for all women who are pregnant during influenza season. The nasal spray influenza vaccine should be avoided because it is made from a live attenuated vaccine, though inadvertent administration of Influenza vaccination during first trimester has no dangerous effects on the fetus, but it helps protect the baby from influenza in the first 6 months after birth, before the baby is eligible for the Influenza vaccine. Federation of Obstetric and Gynaecological Societies of India (FOGSI), World Health Organization recommended immunisation of women against influenza during pregnancy to protect mothers and their babies from serious health complications. India has witnessed a swine flu outbreak that has killed nearly 2,167 people across different states and affected 35,077 people as on April 11, 2015. In Delhi, as on April 9, 12 people had died of the disease while the number of those affected reached 4,254.

Tdap:

The tetanus, diphtheria, pertussis (Tdap) vaccine is recommended for any previously unvaccinated postpartum woman, pregnant women in each pregnancy and should be given as early as possible between 27 and 36 weeks of gestation, to help protect the newborn from pertussis infection. Targeting the last trimester of pregnancy was decided upon in an effort to maximize the high-level antibody transfer to the fetus later in gestation to optimize potential newborn protection. The safety of Tdap vaccine given to pregnant women, the potential benefits of

transplacental antibody from mother to fetus to provide direct passive protection to the neonate, the length of time that antibody persists after immunization in the mother and newborn, and the cost-effectiveness of maternal immunization (immunizing pregnant women for the benefit of themselves and their fetus/newborn) and recommended a dose of Tdap for pregnant women who never received Tdap. TT vaccine is administered to pregnant mother in order to protect the mother and her fetus from Tetanus disease. This life threatening bacterial disease is caused by a bacterium, *Clostridium tetani* which enter the body through wound such as cut, bite, burn, ulcer etc. Tetanus affects the nervous system so better to have TT vaccine during pregnancy. If the expectant mother is not vaccinated, 2 doses are administered. The 1st dose of TT vaccine will be administered in the 2nd trimester and the 2nd dose after 1 month. If the mother is completely immunized during childhood, then 1 booster dose in the second trimester is sufficient. In Kaiser Permanente Northern California from 2010 to 2015, did a retrospective cohort study of infants they were estimated the effectiveness of maternal pertussis vaccination for protecting newborns against pertussis in the first 2 months of life and in the first year of life accounting for each infant DTaP dose. Among 148 981 newborns, the vaccine effectiveness of maternal Tdap was 91.4% during the first 2 months of life and 69.0% during the entire first year of life. The vaccine effectiveness was 87.9% before infants had any DTaP vaccine doses, 81.4% between doses 1 and 2, 6.4% between doses 2 and 3, and 65.9% after infants had 3 DTaP doses.

5. Recommended Vaccines for all pregnant mothers with risk:

Hepatitis A:

Hepatitis A is a disease that caused by the hepatitis A virus. The virus mainly causes inflammation of the liver, generally feeling unwell, yellowing of skin and the whites of eyes (jaundice), vomiting and fever. The hepatitis A virus is passed out in the stools of infected people and infection is usually spread by eating contaminated food or drink. Hepatitis A should immunized against travelers to countries outside, the highest-risk areas include the Indian subcontinent (in particular India, Pakistan, Bangladesh and Nepal), Africa, parts of the Far East (except Japan), South and Central America and the Middle East, Close contacts of someone with hepatitis A, people with chronic liver disease, people exposed to hepatitis A at work, staff of some large residential institutions, injecting drug users, people with certain blood clotting problems, men who have sex with men. Safety of hepatitis A vaccination during pregnancy has not been recommended. Because hepatitis A vaccine is produced from inactivated virus, the risk to the developing fetus is expected to be low. Hence, theoretic risks of vaccination should be considered against the risk for hepatitis A infection in pregnant women who may be at risk for exposure. If a pregnant woman is exposed to hepatitis A infection, the immune globulin is strongly recommended; the immunoglobulin is considered safe and is more than 85 percent effective in preventing acute hepatitis infection during pregnancy.

Hepatitis B:

Hepatitis B is caused by DNA virus. It can cause both short term and long term diseases. Short term may have abdominal pain, nausea, fatigue, and jaundice. If the infection is acquired soon after birth, the risk of it becoming chronic is around 90%. The primary routes of HBV transmission are perinatal (from mother to baby at birth)--the risk of HBV infection among infants born to HBV-infected mothers ranges from <10% to >85%, with higher rates of transmission from mothers who are HBeAg-positive and lower rates of transmission from mothers who are HBeAg-negative; child to child, through frequent interpersonal contact of non-intact skin or mucous membranes with blood-containing secretions, or perhaps saliva from unsafe injections and transfusions, sexual contact, and tattooing and scarification. The hepatitis B vaccine is an inactivated virus vaccine, composed of noninfectious Hepatitis B surface antigen particles; it should theoretically cause no increased risk. There were no adverse pregnancy outcomes reported in several small studies following women vaccinated with Hepatitis B vaccine during pregnancy. However, extensive safety data are limited, there appears to be no increased risk of adverse fetal outcomes when the hepatitis B vaccine is administered during pregnancy. Pregnancy is therefore not considered a contraindication to vaccination, and the Advisory Committee on Immunization Practices (ACIP) and the Public Health Agency of Canada recommend that the vaccine should be offered to pregnant women at high risk of acquiring hepatitis B infection.

Meningococcal Disease

Pregnancy should not preclude vaccination with Meningococcal conjugate vaccines or Meningococcal polysaccharide vaccine, if indicated. Women of childbearing age who become aware that they were pregnant at the time of Meningococcal conjugate vaccines should contact their health-care provider or the vaccine manufacturer so that their experience might be captured in the vaccine manufacturer's registry of vaccination during pregnancy. No randomized controlled clinical trials have been conducted to evaluate use of Meningococcal B vaccines in pregnant or lactating women. Vaccine should be delayed in pregnant and lactating mother unless the mother is at increased risk, after consultation with her health care provider, the benefits of vaccination are considered to outweigh the potential risks.

Pneumococcal Disease

Pneumococcal disease has the potential to settle the upper respiratory tract, resulting infection in upper respiratory tract. Pneumonia is likely increase during pregnancy due to physiological respiratory and cardiovascular changes associated with parturition. Premature labor is also associated with maternal pneumonia during pregnancy. To prevent pneumococcal disease in pregnancy, immunization during pregnancy is a strategy that can provide young infants protection from these pathogens. Administration of pneumococcal polysaccharide vaccine (PPV) to women in the third trimester of pregnancy was safe and well tolerated. The childhood vaccine pneumococcal conjugate vaccine (PCV) protects against 13 strains of the pneumococcal bacterium, while the adult vaccine pneumococcal polysaccharide vaccine (PPV) protects against 23 strains.

The pneumococcal vaccine is 50-70% effective at preventing pneumococcal disease. Both the PPV and the PCV are inactivated or "killed" vaccines and do not contain any live organisms. While 2015, recent articles shows do not support the need for widespread use of PCV or PPV during pregnancy, a systematic review of observational studies and randomized trial of PPV given during pregnancy demonstrated no maternal or fetal safety concerns. Furthermore, maternal PPV vaccination provides protective antibody levels for at least one year following delivery and higher neonatal antibody levels. A recent Cochrane review found insufficient evidence to suggest that maternal vaccination could reduce infant pneumococcal infection via passive immunization. Nevertheless, in accordance with CDC guidelines for adult immunization, PPSV23 should be given to pregnant women for their own benefit with additional risk factors.

Vaccines to avoid during pregnancy

The vaccines that contain live virus are risky to the baby:

- Rubella containing vaccine
- Mumps containing vaccine
- Small pox vaccine
- Yellow fever vaccine
- Typhoid vaccine
- Oral polio vaccine
- Influenza live vaccine (nasal spray)

6. Conclusion

Immunization during pregnancy is a vital preventive measure in routine obstetric care, serving to protect mother, fetus and infant. Pregnant women have unique and heightened susceptibilities to greater morbidity and mortality from a variety of bacterial and viral vaccine-preventable diseases. Influenza and Tetanus, diphtheria and pertussis (Tdap) vaccines are specifically recommended for all before, during and after pregnancy while others recommended depending upon risk factors (hepatitis A and B, pneumococcal and meningococcal vaccines). Thus, it is essential that future studies on vaccines in pregnancy focus on immunogenicity and safety for mother and infant and the potential for not only maternal but also direct fetal and infant benefit. Vaccine-preventable diseases for pregnant women and young infants, Obstetric & Gynecologist and Nurse Midwife must take an active role in educating and administering vaccines to pregnant women.

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