

## **Prenatal Infection Prevention: The Role of Personal Healthcare and Public Healthcare Systems**

**Chika J Mbah\***

*Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, Enugu State, NIGERIA*

**\*Corresponding Author:** Chika J Mbah, Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, Enugu State, NIGERIA.

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### **Abstract**

Prenatal infection is considered to be an illness capable of being transmitted from mother to baby during pregnancy or the delivery process. Causative agents responsible for these infections include bacteria, fungi, parasitic and viral agents. Viral infections seem to be the most prevalent of the infections. Prenatal infection prevention entails both personal preventive measures as well as national/regional preventive measures. Prenatal testing following official guidelines as well as limiting the number and types of reservoirs for infectious agents will greatly assist to prevent mother-to-child transmission.

**Keywords:** *Prenatal Infection; Personal Preventive Measures; National/Regional Preventive Measures*

### **Introduction**

Prenatal infection can be defined as an illness capable of passing from a mother to her baby during pregnancy or the delivery process. The month of February every year has been chosen as International Prenatal Infection Prevention Month in order to promote awareness of common infections passed on from mother to her child. To accomplish this, World Health Organization, and other National/Regional Healthcare Institutions of various countries and regions have provided guidelines responsible for the development of national/regional policies and procedures related to prevention of mother-to-child transmission. Prenatal infection does depend on the dynamic relationship between the infectivity, pathogenicity and virulence of the causative pathogen (s) and the intrinsic susceptibility to infection by prenatal woman. The prenatal infection pathogens can be bacterial, viral, fungi and parasitic infections [1].

In the present article, the objectives are to (i) enumerate some global prenatal infectious diseases as well as tropical diseases that afflict rural prenatal women in sub Saharan Africa region (ii) present preventive measures towards these infectious diseases as expected from prenatal women as well as National/Regional healthcare institutions.

### **Prenatal infection**

#### **Viral infections**

**These might be the most implicated in prenatal infection and they include:**

1. Common cold (viral rhinitis) caused by a number of strains of viruses (rhinovirus, influenza virus, parainfluenza virus, adenovirus, echovirus, coxsackievirus and human metapneumovirus). Common symptoms include cough, blocked or running nose, headache, sore throat [2]. Communicability is through inhalation of airborne droplets, deposition of large particle droplets on nasal or conjunctival mucosa, direct contact via contaminated hands and linens.

2. Conjunctivitis (pink eye). It is the inflammation of the conjunctiva of the eye. The symptoms include tearing, irritation, redness of eye(s), edema of lids, photophobia, pus drainage [3]. Communicability is mostly through contact with discharges from infected patient.
3. Influenza (flu) is an acute viral infection of the upper or lower respiratory tract. The symptoms include sudden onset fever, chills, dry cough, malaise (not feeling well), musculoskeletal aches, nasal discharge, mild sore throat, tiredness, and varying degrees of soreness in the head and abdomen [4]. Communicability is through inhalation of airborne droplets especially in crowded areas where people are in direct contact.
4. Hepatitis B: It is the inflammation of the liver. Symptoms include dark urine, fatigue, fever, jaundice. light- colored stools and mild flu-like symptoms [5]. It can also be asymptomatic. The disease can progress into cirrhosis and liver cancer. Communicability is through contact with blood and other body fluids such as semen, vaginal fluid and saliva.
5. Meningitis: It is an inflammation of the tissue covering the brain and spinal cord caused by bacteria or virus. Viral meningitis is the most common type of meningitis and a self-limited ailment lasting for 7-10 days. The bacterial meningitis is a very serious infection. The symptoms include arthralgia (achy joints), altered mental status, chills, headache, fever, lethargy, malaise, nuchal rigidity (stiff neck) with flexion, seizures and vomiting [6]. Communicability is through close contact with oral secretions, crowding, droplets; lower socioeconomic status, smoking. Viral meningitis can also be spread through contact with feces of infected person.
6. Pneumonia- It involves lung infection caused by bacteria or virus. The symptoms include chills, cough, crackles and wheezes heard on breath sounds, dyspnea, high fever, pleuritic chest pain worsened by deep inspiration [7]. Communicability is through inhalation of airborne droplets from a sneeze or cough.
7. Avian (or Bird Flu): The symptoms include acute respiratory distress, cough, eye infections (conjunctivitis), muscle aches, pneumonia and sore throat [8]. Communicability is through direct contact with infected poultry, contaminated surfaces and objects contaminated with animal feces.
8. Cytomegalovirus (CMV): CMV infection is the leading infectious cause of mental retardation and sensorineural deafness in newborns. The symptoms include persistent fever, malaise and myalgia [9]. Communicability is through body fluids such as blood, cerebrospinal fluid, plasma, saliva, serum and urine.
9. Zika virus: It is an Aedes mosquito-borne flavivirus. The symptoms include conjunctivitis, eye pain, fever, muscle pain, maculopapular rash and prostration [10]. Communicability is through infected Aedes mosquito bites, sexual intercourse with infected person. It is capable of causing birth brain defect on newborns.
10. Human immunodeficiency virus (HIV): It is a virus that attacks the immune system of human body. The symptoms are diarrhea, fatigue, fever, sore throat, swollen glands and skin rash [11]. Communicability is through blood, breast milk, pre-seminal fluid, rectal fluids, semen and vaginal fluids.
11. Covid-19 virus (Corona virus disease); Coronavirus belongs to the family of *Coronaviridae*, which infect both animals and humans. The symptoms include cough, fever and shortness of breath [12]. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome. Communicability is through inhalation of airborne droplets especially in crowded areas where people are in direct contact.

## The bacterial infections

### The diseases that might be mostly implicated in prenatal infection include

1. Tuberculosis: It primarily affects the lungs however any part of the body can be affected. The causative organism is *Mycobacterium tuberculosis*. The symptoms include chills, chronic cough (productive or non-productive), fatigue, fever, hemoptysis, night sweats and weight loss [13]. Communicability is through airborne respiratory droplets, stool, urine, blood and other body fluids, infected wounds.
2. Listeriosis: It is a bacterial infection caused by listeria. The symptoms include fever, fluid-like symptoms such as fatigue, muscle aches [14]. Communicability is by eating foods contaminated with the causative agent.
3. Cholera: is an infectious disease caused by a bacterium called *Vibrio cholera*. The symptoms include severe watery diarrhea, vomiting, dehydration [15]. Communicability is through municipal water supplies, raw or undercooked fish and seafood from sewage polluted waters, foods and drinks marketed on the streets, vegetables grown with human wastes contaminated waters.

These potential bacterial and viral prenatal infections could occur in any of the World regions namely African region, American region, Eastern Mediterranean region, European region, South-East Asia region, and Western Pacific region.

However, in addition to the bacterial and viral infections, there are other prenatal infections which are more prevalent in many developing countries namely tropical and sub-tropical Africa, Asia, Latin America and the Middle East. Some of the tropical infections include

1. Leishmaniasis: Is an infection caused by *Leishmania* parasite. The symptomatic prenatal woman develops one or more sores on her skin [16]. The sores initially appear as nodules (lumps) or papules (bumps). Swollen glands may also appear near the sores. Furthermore, prenatal woman with visceral leishmaniasis shows symptoms such as fever, enlargement of the spleen and liver, weight loss, anemia (low red blood cell count), leucopenia (low white blood cell count) and thrombocytopenia (low platelet count). The infection might also be asymptomatic. Communicability is through phlebotomine sand flies, congenital transmission during blood transfusion, sharing of contaminated needles.
2. Malaria: Malaria is a life-threatening disease caused by *Plasmodium* parasite. Symptoms include: chills, body aches, fever, headache, malaise, nausea and vomiting, sweating [17]. Communicability is through the bites of an infected *Anopheles* mosquito.
3. Schistosomiasis (Bilharzia): An infection caused by a parasite (*Schistosoma*). The symptoms include chills, cough, fever, muscle aches and rash or itchy skin [18]. Most patients show no symptoms at the early stage of the infection. Communicability is through wading, swimming, bathing, or washing in contaminated water thus enabling *Schistosoma* parasites to penetrate the skin.
4. African trypanosomiasis: It is a parasitic infection caused by *Trypanosoma brucei rhodesiense* (East African region) or *Trypanosoma brucei gambiense* (West African region). The common symptoms are aching muscles and joints, severe headaches, extreme fatigue, fever, irritability, swollen lymph nodes [19]. Other symptoms include skin rash, progressive confusion and neurologic problems that manifest following invasion of the central nervous system (second stage). Communicability is mostly through tsetse fly bites. Other rarely routes are sexual intercourse, blood transfusion, organ transplantation.
5. Onchocerciasis: It is a parasitic worm (*Onchocerca volvulus*) infection. Symptoms include skin rash (usually itchy), eye infection, nodules under the skin [20]. Communicability is mostly through blackfly bites. Prenatal rural women in Africa region tend to be more vulnerable to these tropical infectious diseases because recently, more rural females get engaged with the major

responsibility for subsistence farming and family welfare, thus they get exposed to infective bites of flies which transmit these tropical diseases. Such infective bites may create serious consequences on their reproductive functions. These tropical diseases can act synergistically with some non-parasitic diseases to produce severe disability sometimes leading to death of prenatal rural women.

### Prenatal infection prevention

#### Personal preventive measures

Some of the personal preventive measures include good hand washing (in the case of common cold, meningitis, avian flu, cytomegalovirus infection, cholera, tuberculosis), laundering of bed linens, pillowcases, towels (in the case of conjunctivitis), wearing of mask (in the case of Covid-19 infection, meningitis, pneumonia, tuberculosis), good hygiene during food preparation (in the case of avian flu), avoiding eating refrigerated foods (in the case of listeriosis), permethrin-impregnated clothing (in the case of African trypanosomiasis, malaria), insect repellants (in the case of African trypanosomiasis, leishmaniasis, malaria, onchocerciasis), bed nets (in the case of malaria), outdoor nets (in the case of African trypanosomiasis, leishmaniasis, malaria, onchocerciasis), wearing of rain boots (in the case of schistosomiasis) bottled, boiled, or chemically disinfected water, latrines or other sanitation systems, like chemical toilets (in the case of cholera).

National/Regional Health Systems Preventive Measures: Some of these preventive measures include

- Implementation of National/Regional or World Health Organization policies to minimize the risk of spread of prenatal infection. Such policies include (i) antimicrobial policy- administration of prophylactic antibiotic agent(s) only when indicated, and selection will be based on its specificity, efficacy and safety, For example WHO guidelines in treating HIV infections require the use of antiretroviral drugs [21] (ii) disinfection policy-hand-washing compliance is required which may involve washing of hands with plain or antimicrobial soap and water or rubbing the hands with alcohol-based formulation [22], (iii) policy on guidelines for prevention of infections-using personal protective equipment namely gloves, facemasks, face shield, social distancing, eye goggles, gowns or aprons and observing respiratory hygiene/cough etiquette), (iv) isolation policy- implementation of specified quarantine period in the case of dangerous infectious agents (v) outbreak of infection investigation policy-using team medical experts to evaluate the epidemiological triad (infectious agent-host-environment), transmission basics, disease diagnosis etc. (vi) surveillance policy-surveillance activities will help to routinely identify infectious agents within their reservoirs. For example if human beings are the reservoirs of an infectious agent, early and rapid diagnosis and treatment will assist to decrease the period of infection as well as the risk of transmission (vii) immunization policy-provision of high quality and safe vaccines or immunoglobulins [23].
- The coordination of intervention activities within and between nations/regions for optimal prevention of the spread of infectious agents. Typical example is travel restrictions to endemic or pandemic infected areas as in the recent case of Covid-19 pandemic outbreak.

These prenatal prevention measures discussed are not by any means all the preventive measures expected from a prenatal woman to ensure her good health and that of the unborn child.

### Conclusion

Prenatal infection is one of those infections that could be acquired mostly from indoor environment such as homes, non-industrial workplaces, hospitals, other health facilities and public buildings. Infections during pregnancy can lead to premature delivery, miscar-

riage, stillbirth, life-threatening infection of the newborn. In general, most prenatal infections can be prevented by ensuring healthy pregnancy habits namely proper nutrition, practicing good hygiene, avoiding hostile environment that could lead to very serious infections, receiving routine prenatal screening, obtaining prenatal care and immunizations. Finally, primary prevention which aims to protect the prenatal woman by not allowing infection never to occur should be the mainstay for prenatal infection prevention.

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