

# **Swine Flu**

## **Clinical Management and Infection Control Measures**

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# H1N1 VIRUS INFECTION

(*Syn: Swine influenza / S-OIV infection / H1N1 - A virus infection*)

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## **Introduction:**

H1N1 Virus Infection is primarily a respiratory disease of pigs affecting human beings, caused by **type A Influenza** viruses with regular outbreaks in pigs. Source of the virus in swine are avian, human and swine. All three viruses re-assort and form a new virus which is a mixture of all three. At present there are four types H1N1, H1N2, H3N2 and H3N1. The present pandemic is by **Influenza A H1N1 type**.

## **Characteristics of the Influenza viruses**

*Influenza* viruses belong to the orthomyxoviridae family, with three separate genera A, B, and C based on antigenicity of the nucleoprotein (NP) and matrix (M) protein. Influenza A has subtypes based on surface antigens of Hemagglutinin (H) 16 distinct subtypes (H1 to H16) and Neuraminidase (N) antigens 9 distinct (N1 to N9) subtypes. Only H1, H2, H3, N1, and N2 have been associated with epidemics.

## **Epidemiology**

Epidemics of H1N1 - A begin abruptly, peak over a 2 to 3 week period and generally last for 2–3 months. There is an increase in the number of children with febrile respiratory illnesses followed by increase in rates of influenza-like illnesses among adults. Eventually there is a spurt in hospital admissions for pneumonia, exacerbations of chronic pulmonary disease and worsening of preexisting congestive heart failure.

## **Transmission of H1N1 Virus:**

- Mainly airborne:
  - Droplet infection: When an infected person coughs or sneezes large-particle respiratory droplets are released. These droplets being large, generally travel only a short distance (<1 meter). Droplets cannot remain suspended in the air for long and hence settle on the surfaces.

- Direct contact:
  - Pigs/Bird to human
  - Environment to human
  - Non-sustained limited human-human
  
- Fomites

The infectious period is one day before until 7 days after the case's onset of illness. Data available indicate that this virus is transmitted in ways similar to other influenza viruses.

### **Virus survives well in environment**

- Contaminated manure- 3 months in cool temp.
- Water- 4 days at 22 degree cent. (30 days at 0 degree)
- Non porous (stainless steel) surface- 24 hrs.
- Porous (handkerchief, tissue paper) surface- 12 hrs
- Hand – 5 minutes.

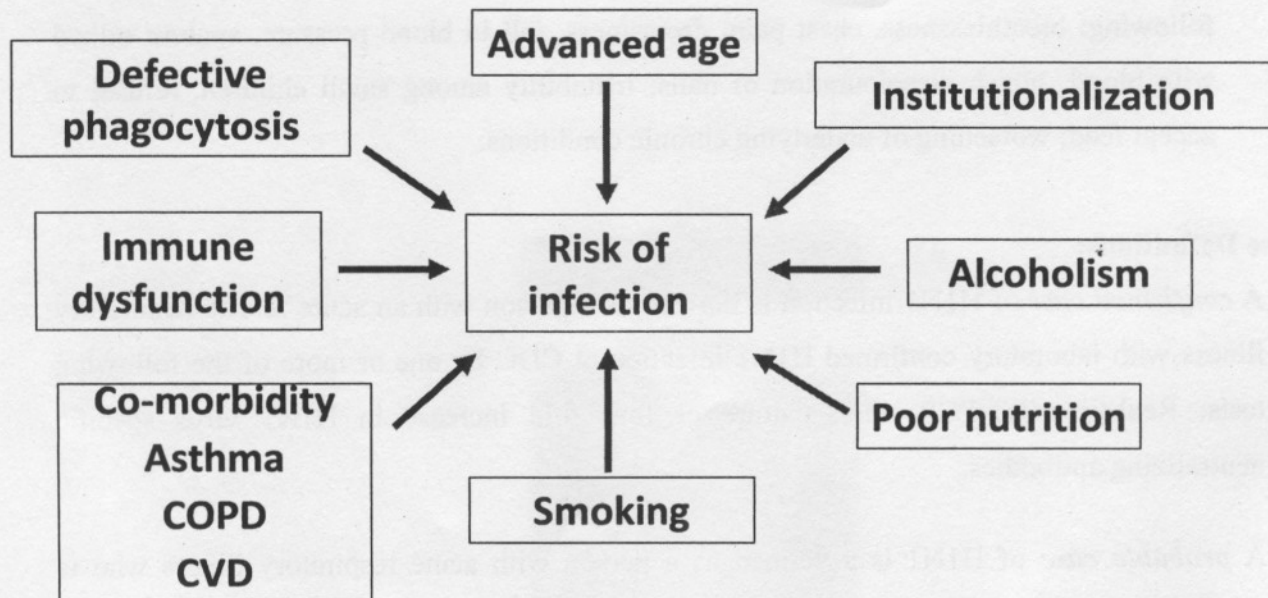
Because of the above, spread is either by a direct contact between source and recipient persons or by respiratory-droplet contaminated surfaces. All respiratory secretions and body fluids (diarrheal stool) of (H1N1) patients should be considered potentially infectious.

### **High risk population for H1N1 virus infection:**

Populations at high risk are:

- Children less than 5 years old
- Adult persons aged above 65 years.
- Pregnant women
- Adults and children with chronic diseases like involving respiratory, cardiovascular, hepatic, hematological, neurologic, neuromuscular or metabolic disorders or immunosuppression (caused by medications including corticosteroids or by HIV) and residents of nursing homes, other chronic-care facilities are also more vulnerable for H1N1 infection.

## Host Risk Factors for Infection



### Latest Guidelines by Government of India:

As per recent guidelines given by Government of India, patients who are suspected to have A (H1N1) influenza are categorized in three groups.

**Category A:** Patients with mild fever plus cough / sore throat with or without body ache, headache, diarrhoea and vomiting.

#### Category B:

1. In addition to all the signs and symptoms of Category A, if the patient has high grade fever and severe sore throat, he / she may require home isolation and Oseltamivir;

2. In addition to all the signs and symptoms of Category A, individuals having one or more of the following high risk conditions, viz.,

- Children below 5 yrs
- Adults above 65 yrs
- Pregnant women
- Those with lung, heart, liver, kidney diseases, blood disorders, diabetes, neurological disorders, cancer and HIV / AIDS, patients on long term cortisone therapy.

## Category – C:

- In addition to the symptoms of Categories A and B; if the patient has one or more of the following: breathlessness, chest pain, drowsiness, fall in blood pressure, sputum mixed with blood, bluish discolouration of nails; irritability among small children, refusal to accept feed; worsening of underlying chronic conditions.

## Case Definitions:

A **confirmed case** of H1N1 infection is defined as a person with an acute febrile respiratory illness with laboratory confirmed H1N1 infection at CDC by one or more of the following tests: Real-time RT-PCR, viral culture or four fold increase in H1N1 virus specific neutralizing antibodies.

A **probable case** of H1N1 is defined as a person with acute respiratory illness who is positive for influenza A but negative for H1 & H3 by RT-PCR.

A **suspected case** of S-OIVA (H1N1) is defined a person with an acute febrile respiratory illness who has had close contact with a person who is a swine-origin influenza confirmed case *or* travelled to a community in the United States or internationally where there are one or more confirmed swine-origin influenza cases *or* resides in a community where there are one or more confirmed swine-origin influenza A (H1N1) cases.

## Clinical Features of (H1N1) virus infection

### Symptoms:

- Fever, headache, cough, sore throat, rhinorrhea, myalgia, fatigue, vomiting, or diarrhea.
- Patients appear flushed and the skin is hot and dry.
- Pharynx is normal despite a severe sore throat.
- There may be mild cervical lymphadenopathy.
- Illness generally resolves over 2–5 days and recovery occurs in 1 week.
- Cough may persist 1–2 weeks longer and post-influenzal asthenia may persist for several weeks.
- Frank dyspnea, hyperpnoea, cyanosis, diffuse rales and signs of consolidation are indicative of pulmonary complications.

### In Children:

- Little is currently known about this infection in children since it is difficult to distinguish from illnesses caused by other respiratory pathogens by symptoms.
- Symptoms of severe disease may include apnea, tachypnoea, dyspnoea, cyanosis, dehydration, altered mental status and extreme irritability.

### **Complications of H1N1 infections:**

- Most common complication: pneumonia progresses to respiratory failure & Acute respiratory distress syndrome (ARDS) requiring mechanical ventilation
- Multi-organ failure
  - Cardiac and renal dysfunction
- Gastrointestinal involvement
- Sepsis-like syndrome, shock
- Reye's syndrome
- Exacerbations of underlying chronic medical conditions are frequent.
- Other rare complications are viral pneumonia, myocarditis, pericarditis, myositis, rhabdomyolysis, acute and post-infectious encephalopathy, encephalitis, febrile seizures and status epilepticus.

### **H1N1 related Pneumonias**

- Usually bacterial pneumonia is common.
- It is characterized by reappearance of fever, cough, production of purulent sputum with physical and x-ray signs of consolidation.
- Common *Organisms are Str.pneumoniae, Staph. aureus, and H. influenzae.*
- The pneumonia responds to antibiotic therapy when instituted promptly.
- Primary Viral pneumonia is a least common but most severe complication that has a predilection for individuals with cardiac disease particularly those with valvular heart disease (commonly mitral stenosis).
- Manifestations include persistent fever, dyspnoea, and eventual cyanosis. Sputum though scanty can contain blood.
- Diffuse rales may be noted in advanced cases with X-ray showing diffuse interstitial infiltrates and/or ARDS.

## Laboratory Diagnosis:

### 1. Testing for swine-origin influenza A (H1N1) virus

Upper respiratory specimens, nasopharyngeal swab or wash, nasal aspirate or tracheal aspirate should be tested by the state public health laboratory. Real time RT-PCR, viral cultures are to be performed to confirm the H1N1 infection.

### 2. Other useful Laboratory findings:

- Leucopenia, lymphopenia
- Mild to moderate thrombocytopenia
- Elevated aminotransferases
- Hypoalbuminemia

### 3. Radiographic Imaging:

Chest x-ray abnormalities are common in A(H1N1) patients

- Non-specific changes
- Diffuse or patchy infiltrates
- Consolidation
- Pleural effusions - **uncommon**

## MANAGEMENT:

As per recent guidelines given by Government of India, patients who are suspected to have A (H1N1) influenza are categorized in three groups.

### Category A:

- No testing of the patient for H1N1 is required.
- They do not require Oseltamivir and should be treated for the symptoms mentioned above.
- The patients should be monitored for their progress and reassessed after 24 to 48 hrs by the doctor.
- Patients should confine themselves at home and avoid mixing with the public and high risk members in the family.

## Category B:

- No H1N1 tests are required for Category – B.
- They may require home isolation and they should confine themselves at home and avoid mixing with the public and high risk members in the family
- Other options include
  - a. short stay in-patient care
  - b. hospital supervised out-patient care

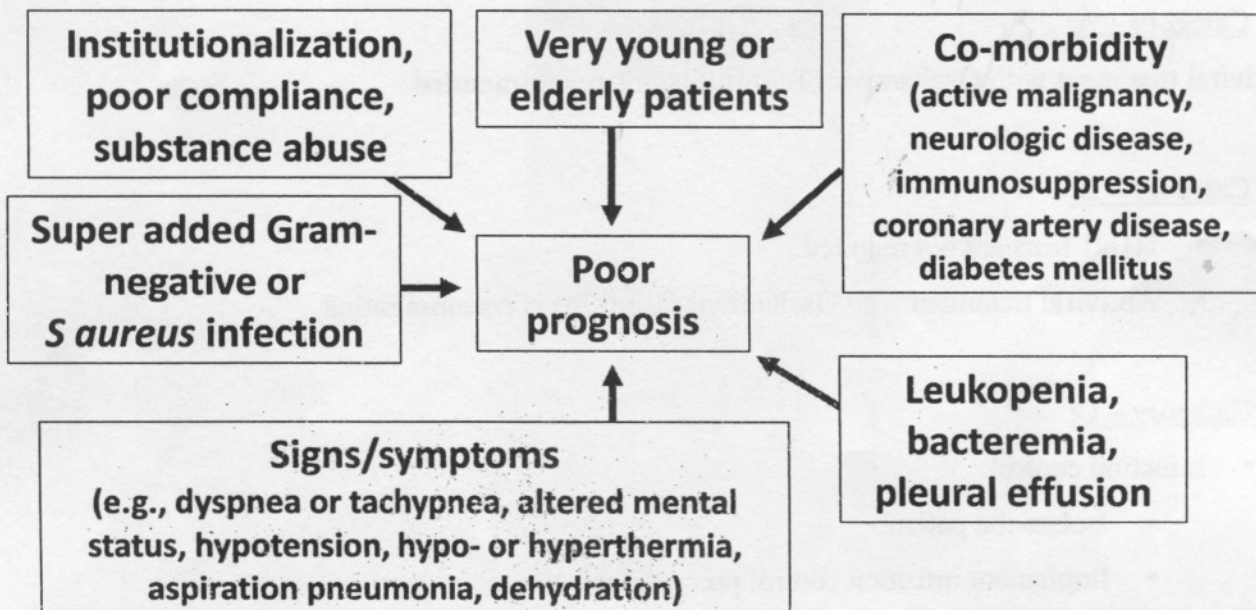
## Antiviral therapy with Oseltamivir

Those with lung, heart, liver, kidney diseases, blood disorders, diabetes, neurological disorders, cancer and HIV / AIDS; patients on long term cortisone therapy shall be treated with Oseltamivir.

## Category – C:

- Manage in hospital as severe pneumonia
- Assess for ICU care and other supportive measures.

## Host Risk Factors for Poor Prognosis





## Supportive measures for H1N1-A virus infection – applicable to all categories

- Bed rest
- Hydration with oral or parenteral fluids and nutritional support
- Cough suppressants generally are not indicated but codeine-containing compounds may be employed if the cough is troublesome
- Management of the metabolic consequences of dehydration and increased metabolic demand.
- Fever management with antipyretics like acetaminophen 4<sup>th</sup> hourly. (*'aspirin' is contraindicated in children and teenagers*).
- Cold sponges, ice bags, ice baths, ice water enemas and sprinkling a patient with water is the optimal approach for hyperpyrexia.

## Antiviral drugs for S-OIV (H1N1)

H1N1 - A virus is susceptible to neuraminidase inhibitor antiviral medications

*Oseltamivir* is an antiviral drug of choice which acts by blocking the release of newly formed virus particles by inhibiting neuraminidase of virus.

## Antiviral treatment guidelines

### For Category – A:

Antiviral treatment with Oseltamivir (Tamiflu) is **not recommended**

### For Category – B:

- H1N1 tests are not required.
- Antiviral treatment with Oseltamivir (Tamiflu) is **recommended**

### For Category – C:

- Infection control:
  - Isolate the patient
  - Implement infection control precautions
  - PPE for HCW and family members
- Supportive care (ICU)
  - Pulmonary: administer oxygen; mechanical ventilation for respiratory failure

- Treatment

- Antiviral medications (oseltamivir)
- *High dose Corticosteroid treatment is not recommended*

Antivirals are to be started within 48 hours of onset of illness. Reduction in mortality or duration of hospitalization is noted even if antiviral therapy is started after 48 hours. Duration of treatment is five days.

### Antiviral drugs and dosages Recommended for H1N1 influenza infection

OSELTAMIVIR (TAMIFLU)			
AGE AND GROUPS	WEIGHT	TREATMENT	CHEMOPROPHYLAXIS
Adults		75 mg caps. twice daily	75 mg caps. Once daily
Children	40 Kg and above	75 mg caps. twice daily	75 mg caps. Once daily
	25 Kg to 40 Kg	60mg caps. twice daily	60 mg caps. Once daily
	15 Kg to 24 kg	45 mg caps. twice daily	45 mg caps. Once daily
	Less than 15 Kg	30 mg caps. twice daily	30 mg caps. Once daily

### Antiviral Chemoprophylaxis for (H1N1) virus infection

Chemoprophylaxis is recommended for high risk individuals with household contacts of *confirmed* case and health care workers or public health workers who were not using personal protective equipment (PPE).

It may be considered in high risk individuals with household contacts and HCW of suspected case of H1N1 and travelers to the countries where the epidemic is going on.

**Post exposure chemoprophylaxis** - considered for contact during the *infectious period*. The duration of chemoprophylaxis *post-exposure* is 10 days after the last known exposure to a confirmed case.

**Pre-exposure protection** is given during the potential exposure period and is continued for 10 days after the last known exposure to a confirmed case.

## **Adverse effects**

Adverse effects of Oseltamivir include nausea and vomiting which might be less severe if it is taken with food. Rarely anaphylaxis, toxic epidermonecrosis (TEN), erythema multiforme (EMF), Steven Johnson's syndrome, transient neuropsychiatric events (self-injury or delirium) have been reported. Persons receiving oseltamivir should be monitored closely for abnormal behavior.

## **Antivirals for Pregnant women with H1N1 infection**

No clinical studies have been conducted to assess the safety of these antivirals in pregnancy but no adverse effects have been reported among women or infants born. Although pregnancy is not a contraindication to oseltamivir, they are used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

## **Antibiotics:**

- Antibiotic prophylaxis should be avoided
- When pneumonia is diagnosed:
  - Antibiotic treatment can be given if bacterial infection is suspected
  - Treat according to published evidence-based guidelines

## **Antibiotics recommended:**

- Macrolide
- Doxycycline
- Respiratory fluoroquinolone
- Beta Lactam
  - Amox, amox – clav, amp – sulbactam
  - Cefuroxime, cefodoxime, cefprozil
  - Cefotaxime, ceftriaxone
- Anti-pseudomonas drugs (if needed)

## **General Precautions for health care personnel**

- Avoid close contact with the sick person
- Keep at least 6 feet distance from the patient
- Hand hygiene
- Use face protection (medical or surgical mask / eye-visor or goggles / face shield )
- Use a gown and clean gloves

## **Personal Protective Equipments (PPE) while treating suspected case**

- Fit tested disposable N95 respirator
- Eye protection (goggles or eye shield)
- Disposable non sterile gloves and gown while going closer to the patients

## **Precautions while treating non suspected case**

- Standard surgical mask for the patients
- Respiratory hygiene
- Using non-sterile glove for contact with the patient, patient secretions or surfaces that may have been contaminated
- Hand washing or cleansing with alcohol based disinfectant after contact

## **Respiratory protection for health care personnel**

- Use face mask or an N95 respirator that fits snugly on your face
- Wear an N95 respirator if you help a sick person with respiratory treatments using a nebulizer or inhaler
- Avoid re-using disposable facemasks and N95 respirators
- After you take off a facemask or N95 respirator, clean your hands with soap and water or an alcohol-based hand sanitizer
- Hand hygiene

## **Surveillance of healthcare personnel**

- If symptoms of infection develop, health worker is instructed not to report for work
- If at work already- should cease patient care activities
- Asymptomatics who have had unprotected exposure should have chemoprophylaxis

## **Guidelines for community with confirmed cases of H1N1**

- If anyone develops ILI (influenza like illness) they must self isolate
- Period of isolation
  - ✓ 7 days after the symptoms started or atleast 24 hours after the symptoms resolved
- If the person should go into the community
  - ✓ Should wear a mask
  - ✓ Handkerchief or tissues may be used for covering if mask is not available

- Household members
  - ✓ Should be given infection control instruction
  - ✓ Should do meticulous hand washing
  - ✓ Should remain home at the earliest sign of infection

### **Personal protection where there is risk of infection**

- Covering the mouth and nose with a tissue while sneezing or coughing
- Throwing the tissue in the trash after use
- Washing the hand with soap and water especially after sneezing and coughing
- Alcohol based hand cleaners are useful
- Touching of eyes, nose and mouth to be avoided
- Avoiding close contact with infected persons

### **Precautions for staff providing care to patients**

- Use a medical or surgical mask
- Emphasize hand hygiene and provide hand hygiene facilities and supplies.
- Use face protection (medical or surgical mask and eye-visor or goggles, face shield) and use a gown and clean gloves.
- Do not forget hand hygiene after PPE removal.

### **References**

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