Review Article

Management of swine flu (H1N1 Flu) outbreak and its treatment guidelines

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ABSTRACT

In its strongest resurgence since the pandemic of 2009, the influenza type A virus, known as H1N1, has broken out in different parts of India with deaths surpassing 1000 mark and number of affected cases exceeding 18,000 by the end of February 2015. Swine influenza spreads from person to person, either by inhaling the virus or by touching surfaces contaminated with the virus, then touching the mouth or nose. Symptoms occurring in infected human by H1N1 are like any other flu symptoms. Treatment is largely supportive and consists of bed rest, increased fluid consumption, cough suppressants, antipyretics and analgesics for fever and myalgias. Management largely includes the potential use of antiviral agents for patients presenting with illness due to influenza virus infection. If the illness is known or suspected to be due to a zoonotic influenza A virus, oseltamivir or zanamivir are treatment options. For known or suspected infection with avian influenza H5N1 virus, antiviral treatment should follow the World Health Organization (WHO) rapid advice guidelines on pharmacological management of humans infected with highly pathogenic avian influenza A (H5N1) virus. WHO also recommends vaccination of the high-risk group with seasonal influenza vaccine. Vaccination is recommended for health care workers working in close proximity to influenza patients are at higher risk of acquiring the disease. Since swine flu can directly be transmitted from one person to another through air droplets, people who fail to follow proper hygiene, especially in crowded places are at a high risk of contracting the virus. Proper preventive and control measures thus must be ensured. We have only limited treatment options, so rational use of the antiviral agent is very essential to avoid resistance and future complications. Health education and awareness among citizens should be transferred by proper mechanism.

Key words: H1N1 swine flu outbreak, influenza A virus, oseltamivir, vaccine, zanamivir

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INTRODUCTION

India is reeling under the worst swine flu outbreak in half a decade with over 18,000 affected cases and over 1000 deaths by the end of February 2015. This year's outbreak of the H1N1 virus is the deadliest in India since 2010. Swine flu, also known as pig influenza, swine influenza, hog flu and pig flu is a respiratory disease caused by influenza viruses infecting the respiratory tract of pigs, resulting in nasal secretions, barking coughs, decreased appetite, and listless behavior, lasting about 1-2 weeks in pigs that survive. It produces most of the same symptoms in pigs as human flu produces in man.

Swine influenza is caused by five influenza A subtypes viz. H1N1, H1N2, H2N3, H3N1, and H3N2. However, in pigs four influenza A virus subtypes (H1N1, H1N2, H3N2, and H7N9) are the most prevailing strains worldwide.[1] Swine influenza was first proposed to be a disease related to human flu during the 1918 flu pandemic, when pigs became ill at the same time as humans. The first identification of an influenza virus as a cause of disease in pigs occurred about 10 years later, in 1930. For the following 60 years, swine influenza strains were almost exclusively H1N1. The pathogen that has seized the world's attention has an official name of swine-origin influenza A H1N1, an acronym (S-OIV), a nickname (swine flu) and an apparent birthplace of Mexico.

However, direct transmission from pigs to humans is rare; nevertheless, the retention of influenza strains in pigs after these strains have disappeared from the human population might make pigs a reservoir where influenza viruses could persist, later emerging to reinfect humans once human immunity to these strains has declined.[2] Food and Agriculture Organisation, has however confirmed that the virus does not spreading through food products and thus possesses no threat to food chain.[3]

Swine flu spread very rapidly worldwide due to its high human-to-human transmission rate and due to the frequency of air travel. In 2015, the instances of Swine Flu substantially increased to 5 years highs with over 18,000 cases reported and over 1000 deaths in India. The states reporting the highest number of cases and deaths are Rajasthan, Gujarat, Delhi, Maharashtra, and Telengana.[4] The sudden spurt of the cases in the beginning of 2015 left the Indian government unexplained but concerned.

DISEASE TRANSMISSION

Influenza is quite common in pigs with the major route of transmission being through direct contact between infected and uninfected animals occurring during animal transport and intensive farming. Airborne transmission through the aerosols produced by pigs coughing or sneezing is also an important means of infection. Transmission may also occur through wild animals, such as wild boar, which can spread the disease between farms. People who work with poultry and swine are exclusively at increased risk of zoonotic infection with influenza virus endemic in these animals, and thus constituting a population of human hosts in which zoonosis and reassortment can co-occur.[5] Vaccination of these workers against influenza and surveillance for new influenza strains among this population may, therefore, be an important public health measure to combat this illness.

Swine influenza spreads from person to person, either by inhaling the virus or by touching surfaces contaminated with the virus, then touching the mouth or nose. Infected droplets are expelled into the air through coughing or sneezing. Research suggested that H1N1 swine influenza is about as contagious as the usual human influenza. If one person in a household gets swine flu, anywhere from 8% to 19% of household contacts likely will get infected.[6]

Moreover, when an infected person coughs or sneezes near a susceptible person, airborne transmission occurs. It requires close contact between the infected and recipient persons because droplets do not remain suspended in the air and travel short distances not more than 6 feet. There is also potential for transmission through contact with fomites that are contaminated with respiratory or gastrointestinal material. Since many patients with swine influenza infection have had diarrhea, the potential for fecal viral shedding and subsequent fecal-oral transmission should be also considered and well-investigated. However, susceptibility of ocular, conjunctival, or gastrointestinal infection remains yet unknown. Studies have shown that Influenza A virus can survive on hard, nonporous surfaces (e.g., stainless steel, hard plastic) for 24-48 h and on porous materials (e.g., cloth, paper) for <8-12 h in ambient temperatures.[7] Virus persistence on surfaces increases up to 72 h when those surfaces are moist or wet.[8]

RISK FACTORS

Since swine flu can directly be transmitted from one person to another through air droplets, people who fail to follow proper hygiene, especially in crowded places are at a high risk of contracting the virus. It is believed that people who are at higher risk for seasonal influenza complications are to be at higher risk for swine influenza complications which includes children <5 years old; Persons aged 65 years or older; Children and adolescents (<18 years) who are receiving long-term aspirin therapy and who might be at risk for experiencing Reye syndrome after influenza virus infection; pregnant women, adults and children with chronic pulmonary, cardiovascular, hepatic, hematological, neurologic, neuromuscular, or metabolic disorders, adults and children with immunosuppression, residents of nursing homes and other chronic-care facilities.[9]

PATHOGENESIS

Recent outbreak of Influenza A (H1N1) so-called "swine flu" strain, first seen in Mexico, should be termed novel H1N1 flu since it was mainly found infecting people and exhibits two main surface antigens, H1 (hemagglutinin type 1) and N1 (neuraminidase type1). The eight RNA strands from novel H1N1 flu have one strand derived from human flu strains, two from avian (bird) strains, and five from swine strains. It has a close similarity with H5N1 in terms of causing cytokines burst, fluid secretions into organs leading to the state of breathlessness. The neuraminidase genetic segment of the virus provides it an ability to break out of infected cells. It possesses significant pandemic potential.[10]

Molecular markers of pathogenicity

7 PB1F2 coding sequence, the smallest protein in the influenza virus is known to be the molecular marker of pathogenicity which is exclusively absent in human influenza viruses. The degree of identity between the viral hemagglutinin molecules of this strain and other human flu viruses is the second marker of virulence that can be assessed by sequences alone. Low identity of hemagglutinin structures indicates that the degree of community immunity resulting from exposure to similar viruses does not blunt the transmission from one human to another. A third molecular marker is a polybasic cleavage site which is a protease site in the viral hemagglutinin. This third site plays an important role in the pathogenicity of avian influenza viruses. These host proteases enable virus fusion with a host cell by activating the hemagglutinin molecule.[11]

Reassortment event

Influenza A virus lacks this PB1F2 coding sequence which indicates a milder disease compared to the other major pandemic viruses. However, mutations resulting in altered expression of PB1F2 might affect this status. Genes shuffling with other influenza viruses, the phenomenon being known as reassortment event, may lead to the incorporation of a gene responsible for PB1F2 production. RNA genomes of Influenza A viruses encode up to 11 proteins including the surface glycoproteins, hemagglutinin, neuraminidase, NS1 virulence factors (host interferon antagonist) and PB1F2 (proapoptotic factor). The presence of a functional hemagglutinin molecule and host cell receptor expression for hemagglutinin, sialic acid decides the entry of viruses into cells.[12]

Incubation period

The estimated incubation period in humans is unknown and could range from 1 to 7 days and more likely 1-4 days. On the basis of data regarding viral shedding from various studies of seasonal influenza, most patients with swine influenza infection might shed virus from 1 day before the onset of symptoms through 5-7 days after the onset of symptoms or until symptoms resolve. In young children and in immunocompromised or severely ill patients, however, the infectious period might be a bit longer.[13] The clinical spectrum of novel swine influenza infection is both self-limited illness and in severe outcomes, it can lead to respiratory failure and death. The severe illness and deaths associated with seasonal influenza epidemics are in large part the result of secondary complications, including primary viral pneumonia, secondary bacterial pneumonia, and exacerbations of underlying chronic conditions. These same complications may occur with swine influenza infection.

Various pathological changes are observed. Sharp line of demarcation between normal and affected lung tissue can be identified with the affected tissue being purple and firm. Interlobular edema can be found in few cases. Airways get filled up with blood-tinged fibrinous exudates with peribronchial and perivascular cellular infiltration. Fibrinous pleuritis is also seen in severe cases. Microscopically lesions show airways filled with exudate, with extensive alveolar atelectasis, interstitial pneumonia, and emphysema. Research revealed that widespread interstitial pneumonia prevails up to 21 days after infection and causes hemorrhagic lymph nodes. Uncomplicated infections might cause changes in the cranial ventral lung lobes. Enlargement of bronchial and mediastinal lymph nodes may occur.[14]

CLINICAL FEATURES

Symptoms occurring in infected human by H1N1 are like any other flu symptoms including fever, chills, headache, upper respiratory tract symptoms (cough, sore throat, rhinorrhea, extreme coldness and irritated watering eyes, reddened eyes, skin [especially face], mouth, throat and nose, shortness of breath), myalgia, arthralgia, fatigue, vomiting, abdominal pain and diarrhea. Certain groups including infants, elderly and persons with compromised immune systems may, however, manifest typical presentations.

DISEASE DIAGNOSIS

Clinicians should suspect novel influenza A virus if an acute febrile respiratory illness or sepsis-like syndrome is presented. However, not all people with suspected novel influenza (H1N1) infection needs to have the diagnosis confirmed, especially if the person resides in an affected area even if the illness is mild. Indications for investigation are if the persons require hospitalization or are at a high risk for severe disease.

For testing H1N1, upper respiratory specimens are collected which includes nasopharyngeal swab/aspirate, nasal swab plus a throat swab or nasal wash, or tracheal aspirate preferably within 5 days of onset of illness. A trained physician/microbiologist preferably should collect the sample before antiviral treatment and keep it in a refrigerator (not a freezer) at 4°C in viral transport media until testing. The samples should be transported within 24 h for due investigations. If the transportation cannot be done within 5 days, then a storage temperature of -70°C and subsequent shipment on dry ice is recommended. Paired blood samples should also be collected at an interval of 14 days for serological testing.

Commercial rapid influenza antigen testing in the evaluation of suspected swine influenza cases should be interpreted with caution as the sensitivity and specificity of rapid antigen testing is unknown. A negative result does not exclude a diagnosis of swine influenza A. A positive result may be helpful, but does not distinguish between seasonal and swine influenza viruses. Therefore, if a patient tests negative for influenza by rapid antigen testing, specimens should be sent for further characterization (including polymerase chain reaction [PCR] and sub-typing) to the local public health laboratories.

The Centers for Disease Control (CDC) has developed a Swine Influenza Virus real-time (RT) PCR detection panel. Among the various diagnostic tests, RT PCR, Nucleotide Sequencing, and phylogenetic analyzes are used.

Real-time polymerase chain reaction

The CDC has developed an RT PCR assay to detect seasonal influenza A, B, H1, H3, and avian H5 serotypes. Primers and probes specific for swine influenza A (H1 and H3 subtypes) has been recently developed and tested for use in a modified version of this assay for the detection of human infection with swine influenza viruses.

Nucleotide sequencing

Amplicons for gene sequencing were generated by reverse transcription, followed by PCR amplification to generate overlapping double-stranded DNA amplicons covering each of eight segments of the influenza virus genome.

Phylogenetic analysis

Phylogenetic analysis of sequences contained six gene segments (PB2, PB1, PA, HA, NP, and NS) which were found in triple-reassortant swine influenza viruses circulating in pigs. The genes encoding the neuraminidase (NA) and M protein (M) were most closely related to those in influenza A viruses circulating in swine populations.[15]

The swine flu flare-up has also pushed an indigenous innovation faster into the market. The government has approved in February 2015, the first India-made swine flu diagnostic kit, developed by Bengaluru-based Molbio Diagnostics, which promises cheaper, faster results with a portable device.[16]

CASE IDENTIFICATION

A suspected case of novel influenza A (H1N1) virus infection is defined as a person who does not meet the confirmed or probable case definition, and is not novel H1N1 test negative, and is/has: A previously healthy person <65 years hospitalized for influenza like illness (ILI) OR ILI and resides in a state without confirmed cases, but has traveled to a state or country where there are one or more confirmed or probable cases OR ILI and has an epidemiologic link in the past 7 days to a confirmed case or probable case.

A probable case of novel influenza A (H1N1) virus infection is defined as a person with ILI who is positive for influenza A, but negative for human H1 and H3 by influenza RTPCR.

A confirmed case of novel influenza A (H1N1) virus infection is defined as a person with ILI with laboratory-confirmed novel influenza A (H1N1) virus infection by RTPCR or viral culture.[17]

TREATMENT

Treatment is largely supportive and consists of bed rest, increased fluid consumption, cough suppressants, and antipyretics and analgesics such as acetaminophen, nonsteroidal anti-inflammatory drugs for fever and myalgias. Severe cases may require intravenous hydration and other supportive measures.

Management largely includes the potential use of antivirals for patients presenting with illness due to influenza virus infection. The two main classes of anti-viral agents available are neuraminidase inhibitors (viz., oseltamivir and zanamivir), and M2 inhibitors (viz., amantadine and rimantadine). If illness is known or suspected to be due to a zoonotic (animal derived) influenza A virus, such as swine influenza viruses (H1, H2, H3) or avian influenza viruses (H7, H9), oseltamivir or zanamivir are treatment options. These neuraminidase inhibitors prevent the virus to escape from the infected cell thereby, preventing the spread of infection, and it might lead to possible aggregation and release. For known or suspected infection with avian influenza H5N1 virus, antiviral treatment should follow the World Health Organization (WHO) rapid advice guidelines on pharmacological management of humans infected with highly pathogenic avian influenza A (H5N1) virus.

Where the infection is known or suspected to be due to seasonal influenza A (H1N1) virus, oseltamivir is unlikely to be effective, but either amantadine or rimantadine may be used when the virus is likely susceptible. Zanamivir is also a treatment option if available.

Treatment recommendations for H1N1 pandemic swine influenza as per World Health Organization guidelines

Patients who report with uncomplicated clinical presentation due to confirmed or strongly suspected virus infection and are in a group known to be at higher risk of developing severe or complicated illness, should be treated with oseltamivir or zanamivir as soon as possible. However, patients who have uncomplicated illness but are not in a group known to be at higher risk of developing severe or complicated illness, may not need to be treated with anti-virals.

In the case of severe or progressive clinical presentation in all patients including children and adolescents, oseltamivir is given as soon as possible. Laboratory confirmation of influenza virus infection is not necessary for the initiation of treatment and a negative laboratory test for H1N1 does not exclude the diagnosis in all patients, therefore early, empiric treatment is strongly recommended. In the case of unavailability of oseltamivir, zanamivir should be used. Patients who have severe or progressive clinical illness, but who are unable to take oral medication may be treated with oseltamivir administered by nasogastric or orogastric tube. Oseltamivir delivered by

nasogastric tube achieves adequate serum levels in critically ill patients as indicated by some observational patients.[18]

Severe or complicated influenza virus infections attributable at least in part to severe immunosuppression have been most frequently described in transplant patients including hematopoietic stem cell recipients, bone marrow transplant patients, and other transplant patients on immunosuppressive chemotherapy. Other patients with severe immunosuppression include those with graft versus host disease, or with hematological malignancies. Another cancer patients undergoing chemotherapy and patients infected with HIV, who have developed severe immunodeficiency, may also need to be treated with oseltamivir is given at higher dose as soon as possible and longer duration of treatment is recommended.[18]

This WHO recommendation applies to all patient groups, including pregnant women, and all age groups, including young children and infants. However in all these cases, if Influenza viruses are known or suspected to be oseltamivir resistant, then zanamivir must be given as soon as possible.[18]

Previously the Government of India had imposed a complete ban on sale of oseltamivir through retail outlets as it was essential to combat its unnecessary consumption due to panic which may result in the development of drug resistance. However in view of the current situation of spreading of Swine flu in India in 2015, the scenario has changed. The Central Drug Standard Control Organization has been continuously engaged in monitoring the availability of drugs, vaccine, and diagnostic kits used for the control of Swine Flu. All State Drugs Controllers have been requested to take necessary measures to ensure that the drugs, vaccine and diagnostics kits of standard quality are available particularly in all the affected States. The concerned manufacturers/importers have also been sensitized to take all necessary measures to ensure the availability of the drugs, vaccine, and diagnostic kits in the country. Any dealers who has the license to sell, stock or distribute the drugs specified under the Schedule X to the Drugs and Cosmetic Rules has been authorized to sell the formulation of oseltamivir phosphate.[19]

Revised guidelines of Ministry of Health and Family Welfare, Government of India on categorization of seasonal influenza A H1N1 cases during screening for home isolation, testing, treatment, and hospitalization are as follows

In order to prevent and contain outbreak of Influenza-A H1N1 virus for screening, testing and isolation following guidelines are to be followed and these will be categorized as under:

Category A

Patients with mild fever plus cough/sore throat with or without bodyache, headache, diarrhea, and vomiting will be categorized as Category-A. They do not require oseltamivir and should be treated for the symptoms mentioned above. The patients should be monitored for their progress and reassessed at 24-48 h by the doctor. No testing of the patient for H1N1 is required. Patients should confine themselves at home and avoid mixing up with public and high-risk members in the family.

Category B

1. In addition to all the signs and symptoms mentioned under Category-A, if the patient has high-grade fever and severe sore throat, may require home isolation and oseltamivir;
2. In addition to all the signs and symptoms mentioned under Category-A, individuals having one or more of the following high-risk conditions shall be treated with oseltamivir:
    - Children with mild illness but with predisposing risk factors
    - Pregnant women;
    - Persons aged 65 years or older;
    - Patients with lung diseases, heart disease, liver disease, kidney disease, blood disorders, diabetes, neurological disorders, cancer and HIV/AIDS;
    - Patients on long term cortisone therapy.

No tests for H1N1 are required for Category-B (i) and (ii). All patients of Category-B (i) and (ii) should confine themselves at home and avoid mixing with public and high-risk members in the family. Broad spectrum antibiotics as per the guideline for community-acquired pneumonia may be prescribed.

Category C

In addition to the above signs and symptoms of Category-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 discoloration of nails;
- Children with ILI who had a severe disease as manifested by the red flag signs (somnolence, high and persistent fever, inability to feed well, convulsions, shortness of breath, difficulty in breathing, etc.).
- Worsening of underlying chronic conditions

All these patients mentioned above in Category-C require testing, immediate hospitalization, and treatment.[20]

Oseltamivir was effective in reducing mortality across the spectrum of severity on early initiation of therapy in adults, pregnant women, and critically ill adult patients. Greatest likelihood of reduced mortality was attributable to treatment initiation within 2 days of symptoms onset. However, delayed treatment was still found to be effective in severely ill patients. Oral oseltamivir might reduce hospitalization, antibiotic uses and duration of symptoms in healthy and

"at risk" adults. Oseltamivir treatment doses for children from 14 days up to 1 year of age should be 3 mg/kg/dose, twice daily. For children <14 days of age, the recommended oseltamivir dose is 3 mg/kg/dose once daily. Lower doses should be considered for infants who are not receiving regular oral feedings and/or those who have a concomitant medical condition which is expected to reduce significantly renal function.

There had been no mention of adverse effects associated with the use of this drug in the published trials. However postmarketing surveillance had uncovered adverse effects such as raised liver enzymes, hepatitis, neuropsychiatric events, cardiac arrhythmia, skin hypersensitivity reactions including toxic epidermal necrolysis, Stevens-Johnson syndrome and erythema multiforme, metabolic side effects and renal events. In some cases, increased QTc prolongation was seen in the electrocardiogram in the treatment group compared with placebo during on-treatment periods. The most important serious adverse events raising concerns were neuropsychiatric events such as depressed mood, behavior disturbance, panic attack, suicidal ideation, delusion, delirium, convulsion, and encephalitis. These were reported more frequently in children than in adults and generally occurred within 48 h of drug intake.

Pregnant women and children aged <1 year with uncomplicated illness due to seasonal influenza A (H1N1) virus infection should not be treated with amantadine or rimantadine due to the risk of adverse effects.

Vaccination

World Health Organization recommends vaccination of high-risk groups with seasonal influenza vaccination. Health care workers working in close proximity to influenza patients are at higher risk of acquiring the disease. Hence, vaccination is recommended for them. Such category would include:

- Health care workers working in casualty/emergency department of identified hospitals treating influenza cases.
- Health care workers working in Intensive Care Unit and isolation wards managing influenza patients.
- Health care workers identified to work in screening centers that would be set up for categorization of patients during seasonal influenza outbreak.
- Health care workers treating/managing the high-risk group laboratory personnel working in virological laboratories testing Influenza samples.
- Rapid response team members identified to investigate outbreaks of influenza.
- Drivers and staff of vehicles/ambulances involved in the transfer of influenza patients.

The vaccine should be used every year. Influenza vaccination is most effective when circulating viruses are well-matched with vaccine viruses. Even with appropriate matching, efficacy of the vaccine may be about 70-80%, especially in geriatric age group. In case the locally circulating virus is different from vaccine virus recommended by WHO, it may not be effective at all. Hence, vaccine should not give a false sense of security. Considering the risk perspective, the preventive modality of infection prevention and control practices like the use of personal protective equipment should be strictly adhered to. The available vaccine takes about 2-3 weeks for development of immunity. The use of chemoprophylaxis during this period may be considered.[21]

Supportive therapy

Supportive Therapy includes maintaining Airway, Breathing and Circulation, maintaining hydration, electrolyte balance, and nutrition. Oxygen therapy is suggested in cases with tachypnea, dyspnea, respiratory distress and <90% oxygen saturation. Mechanical ventilation is suggested along with oxygen therapy.

Indications for Mechanical Ventilation:

- Severe Respiratory Failure
- Failure to achieve oxygen saturation of ≥90% (or $p0_2$ of ≥60 mm Hg) on an $FI0_2$ <0.6.

High-efficiency particulate air (HEPA) filters use is recommended on expiratory ports of the ventilator circuit/high flow oxygen masks for reducing spread of infectious aerosols. Vasopressors are recommended for shock.[21]

Abstinence from smoking is encouraged among smokers. Lower respiratory tract infection and hypoxia must be constantly monitored in every suspected case.

Another approach is to develop novel vaccines against the H1N1 virus. The nasal H1N1 influenza virus vaccine developed is a "live virus" vaccine. H1N1 influenza virus vaccine is also available in an injectable form, which is a "killed virus" vaccine. H1N1 influenza virus vaccine works by exposing the individual to a small dose of the virus, which helps his body to develop immunity to the disease. This vaccine will not treat an active infection that has already developed in the body. H1N1 influenza virus nasal vaccine is for use in people between the ages of 2 years and 49 years.[22]

PREVENTION AND CONTROL MEASURES

- A distance of minimum 6 feet from people having ILI must be kept especially when sneezing or coughing.
- Nose and mouth must be covered with a single use tissue while coughing or sneezing, and the tissue must be disposed in the trash after use or facemask/N95 respirator can be worn if possible and available. Personnel involved in aerosol generating activities (e.g.: Collection of clinical specimens, bronchoscopy, endotracheal intubation, nebulizer treatment) or cardiac, pulmonary resuscitation or resuscitation

involving emergency intubation should also wear a disposable N95 respirator.
- Facemasks and respirators

Facemasks

It refers to disposable facemasks approved by the U.S. Food and Drug Administration as medical devices usually fixed to the head with two ties, covering the face with flexible adjustment for nose-bridge. They avoid the spread of droplets, splashes or sprays from reaching the mouth and nose among person to person.

Respirators: It refers to an N95 or higher filtering face piece respirator approved by CDC or National Institute for Occupational Safety and Health. It protects against inhalation of very small particle aerosols containing viruses from an infected person. It fits snugly on the face, but it is harder to breathe through it for long duration compared to a facemask. Respirators require fit testing, training and medical clearance for proper usage to maximize its effectiveness. There significant difference between facemasks and respirators are that they do not seal tightly to the face and are used against only large droplets. However, N95 respirators seal tightly the wearer's face and protect against small particles.

- Washing hands with soap and water or alcohol-based hand cleaners frequently after coughing or sneezing and when you take off face cover.
- Drink plenty of water and clear fluids to prevent dehydration.
- Avoid touching eyes, nose or mouth to prevent spreading of germs.
- Avoid traveling when sick, for minimum 7 days after you fall sick. Stay home from work or school if you are sick.
- Temporary reassignment of those at increased risk of severe illness/caretakers.
- Separate well-ventilated space should be provided for sick people in the home.
- Consultation with health care providers to enquire about any need for antiviral medications for prevention post contact with an infected person. Contact the doctor in case of any side effects like nausea, vomiting, rash or unusual behavior.
- Medications for symptomatic relief of fever and pain must be taken which include acetaminophen or any cough medicine until symptoms improve.
- Children younger than 18 years should not be given aspirin (acetylsalicylic acid) or products that contain aspirin. Those younger than 4 years should not be administered over the counter cold medications without prescription from your doctor.
- Patients must be placed in a single-patient room with the door kept closed. An airborne infection isolation room with negative pressure air handling is used, if available. Air exhaustion should be done directly outside or can be re-circulated by a HEPA filter.[23,24]

CONCLUSION

Swine flu has been reported numerous times as a zoonosis in humans, usually with limited distribution, rarely with a widespread distribution. Outbreaks in swine are common and cause significant economic losses in the industry, primarily by causing stunting and extended time to market. The mutational behavior of H1N1 has been a major future challenge in the path of pharmacotherapy. Praising virological research that had increased the capability to detect, understand and assess new viruses for pandemic risk and to track their international spread, the WHO noted that this has to be stepped up. Better vaccines and shorter production times than the current are required to address a severe pandemic, according to the WHO.

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