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Swine Flu: Quadruple reassortant" Virus

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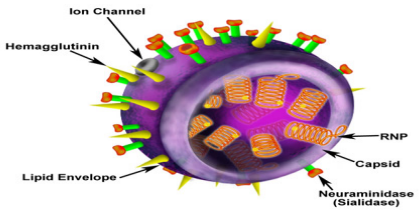
Abstract
Swine flu also known as H1N1 is a new influenza virus which is a respiratory disease of pig has become the world's fastest moving influenza pandemic, sweeping across many countries in a short span of time. It transmitted to humans via contact with infected pigs or environments contaminated with swine influenza viruses. The scientists call this a 'quadruple reassortant" virus. According to the World Health Organization (WHO) worldwide more than 209 countries and overseas territories or communities have reported laboratory confirmed cases of pandemic influenza H1N1. Respiratory failure resulting from severe pneumonia and acute respiratory distress syndrome is main reason for most of the death. This is a dangerous scenario in 21st century. So, there is a need to prevent and to treat the swine flu all over the world.

Keywords: Swine flu, Pandemic influenza, Quadruple Reassortant, Respiratory disease

1. Introduction
Swine flu is an emerging viral infection that is a present global public health problem. There are many thousands cases of swine flu in the present day. This new infection can be seen around the world in the present day. This infection is a kind of variant of H1N1 influenza infection. Due to the nature of respiratory virus, the transmission of this pathogenic virus is air borne transmission. Hence, the rapid spreading and difficulty in control of this infection can be expected. Swine flu, also called pig influenza, swine influenza, hog flu and pig flu. Swine influenza virus (SIV) or S-OIV (swine-origin influenza virus) is any strain of the influenza family of viruses that is endemic in pigs.[1,2] Commonly referred to as the **flu**, is an infectious disease caused by RNA viruses of the family Orthomyxoviridae (the influenza viruses), that affects birds and mammals. The most common symptoms of the disease are chills, fever, sore throat, muscle pains, severe headache, coughing, weakness/fatigue and general discomfort [1]. Sore throat, fever and coughs are the most frequent symptoms. In more serious cases, influenza causes pneumonia, which can be fatal, particularly for the young and the elderly. Although it is often confused with other influenza like illnesses, especially the common cold, influenza is a more severe disease than the common cold and is caused by a different type of virus [2].
It is the H1N1 type that generally causes seasonal influenza worldwide each year and kills tens of thousands of people. Influenza A (H1N1) virus is a subtype of influenza A virus and the most common cause of influenza (flu) in humans. Other strains of H1N1 are endemic in pigs (swine flu) and in birds (avian influenza). Swine influenza A viruses are RNA viruses with a segmented genome that is comprised of eight negativesense, single-stranded RNA segments, belong to the viral family of Orthomyxoviridae [3]. These eight segments encode eleven proteins. The polymerase complex includes the PB2, PB1 and PA proteins as well as the nucleoprotein (NP). There are two surface glycoproteins, hemagglutinin (HA) and neuraminidase (NA) [4]. (FIGURE 1)



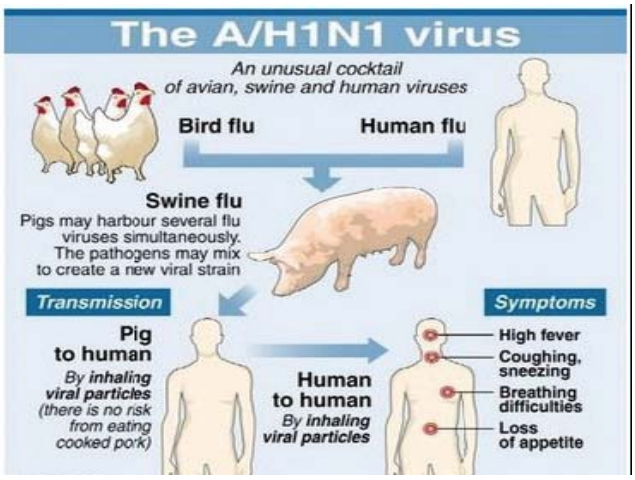
In April 2009, in California (USA), the first novel Swine Origin Influenza A (H1N1) virus was detected, it quickly spread to other parts of the Americas, Europe, Australia, and Asia within a short span of time [5]. This pandemic flu is different from ordinary flu because it's a new flu virus that appears in humans and spreads very quickly from person to person worldwide. On June 11, 2009, the World Health Organization (WHO) raised the alert level to the highest [6] indicating the ongoing pandemic of this viral infection, within two months of the discovery of this new virus. Most infected children or adults recover uneventfully with supportive treatment. However, continuing monitoring across the world is important to reveal the true impact of this infection globally.

Epidemiological Aspects

As on 19 October 2009, more than 414 000 cases and about 5000 deaths had been reported to WHO by 195 countries worldwide [7]. The 3 hardest hit countries in the region are Thailand (26 465 cases, 165 deaths), India (11 068 cases, 351 deaths) and Indonesia (1097 cases, 10 deaths). In India the state of Maharashtra is the worst affected, followed by Karnataka

Transmission Andincubation

Like most viruses, it enters the body through the mucous membranes - the eyes, the nose or the mouth. Swine flu is spread just like the regular seasonal flu spreads. It goes from person to person through close contact and direct touch, indirect touch, or respiratory droplets that carrying the virus. Infected person may be able to infect others beginning one day before symptoms develop and up to seven or more days after becoming sick. Infected people may be able to infect others beginning 1 day before symptoms develop and up to 7 or more days after becoming sick [8]. (FIGURE 2)



People with swine influenza virus infection should be considered potentially contagious as long as they are symptomatic and possible for up to 7 days following illness onset. Children, especially younger children, might potentially be contagious for longer periods. Swine influenza viruses are not transmitted by food. Any person cannot get swine influenza from eating pork or pork products. Eating properly handled and cooked pork and pork products are safe. Cooking pork to an internal temperature of 160 °F (72 °C) kills the swine flu virus as it does other bacteria and viruses.

Every virus, bacteria or pathogen of any time has a certain incubation period. This period is the time it takes after the pathogen enters the body, for the symptoms to appear. Like all influenza pathogens the average incubation period is two days. However, studies have shown individual periods to range between one day to seven days, over all. As such, there is quite a dispute all over the world about the incubation period. Hence, as a suggestion it would be wise to keep an eye out for approximately 10 days to be sure of the infection. Most US cases have shown the incubation period to be between two to seven days [8].

Clinical Presentation

The data available indicate that the clinical spectrum of infection with the H1N1 virus is broad, and ranges from mild upper respiratory tract illness to severe complications such as pneumonia resulting in respiratory failure, acute respiratory distress syndrome (ARDS), multi-organ failure and death [9]. Like seasonal flu, a great majority of cases have fever, cough, sore throat and a runny nose. Gastrointestinal symptoms such as diarrhoea have been reported in 20%–50% of patients, and do not require hospitalization [10, 11]. What is critically important, however, is that in a small proportion of patients, the clinical course tends to deteriorate rapidly, leading to complications and death [12, 13].

In some countries, the main reason for hospitalization is primary viral pneumonia or viral pneumonitis. Among fatal cases, microbiological evidence of a secondary bacterial or fungal infection has been observed. In the USA, >70% of hospitalized patients and approximately 80% of fatal cases have had underlying conditions considered to put them at high risk for complications

Laboratory Diagnosis

Currently, confirmatory diagnostic tests can be done by specialized laboratories in many countries. Reverse-transcriptase polymerase chain reaction (RT-PCR) provides the most timely and sensitive evidence of infection [14]. Clinical diagnosis (based on acute onset of fever and cough) can be increasingly predictive of infection as the prevalence of infection increases. At present, there is no validated rapid bedside diagnostic test (including so-called 'point-of-care' diagnostic tests). Commercially available rapid tests for seasonal influenza have uncertain sensitivity (between 10% and 60%) and lack specificity. Both positive and negative results from such tests should be interpreted with caution.

Treatment Modalities for Swine Flu

In the early phase of the infection, oesltamivir and zanamivir, neuraminidase inhibitor antiviral medications, is used. However, this strain is resistant to adamantanes, such as amantadine and rimantadine [15, 16].

It is a prodrug with an elimination half life of about 6-10 h, hydrolyzed by liver to its active metabolite oseltamivir carboxylate. Oseltamivir is a neuraminidase inhibitor, serving as a competitive inhibitor of sialic acid, found on the surface proteins of normal host cells. By blocking the activity of the neuraminidase, oseltamivir prevents new viral particles from being released by infected cells [17].

Zanamivir is administered by inhalation with a dry powder inhaler. It shows 10-20% bioavailability of the drug by inhalation as that of 2% by oral administration. About 90% of the absorbed dose is excreted unchanged in the urine. The elimination half-life in serum of zanamivir is about 2—5

h.Zanamivir is a selective inhibiter of neuraminidase, an enzyme that cleaves sialic acid from host and viral cell surfaces and thereby facilitates the release of progeny virus from infected host cells 2s. Zanamivir is thought to prevent neuraminidase from cleaving sialic acid from host cells by blocking the active site of neuraminidase. The resultant binding of viral hemagglutinin to the uncleaved sialic acid hinders release of nascent viruses from the host cell and causes them to clump at the host cell surface, with a net reduction in the amount of active virus. The therapeutic dose is 10 mg inhaled twice daily for 5 days starting within 48 h of the initial symptoms. The recommended doses for children are the same. Because zanamivir therapy requires the patient to voluntarily inhale through the device, oseltamivir may be preferred over zanamivir for young children.

Prevention of Swine Flu Infection

The CDC recommends taking these steps:

- Wash your hands regularly with soap and water, especially after coughing or sneezing. Scrub for at least 20 seconds and rinse thoroughly.
- If soap and water are not available, wash your hands with an alcohol-based hand gel. Rub your hands together until the alcohol dries completely.
- Avoid close contact that is, being within 6 feet with people who have flu like symptoms.
- Avoid touching your mouth, nose, or eyes. That's not easy to do, so keep those hands clean.
- People who have or are suspected of having swine flu should wear a face mask, if available and tolerable, when sharing common spaces with other household members, when outside the home, or when near children or infants.
- Breastfeeding mothers with swine flu symptoms should express their breast milk, and the child should be fed by someone else.

Personal Protection Equipments

PPE reduces the risk of infection if used correctly.

It includes:

- Gloves (nonsterile),
- Mask (high efficiency mask) / Three layered surgical mask,
- Long sleeved cuffed gown,
- Protective eyewear (goggles/visors/face shields),
- Cap (may be used in high risk situations where there may be increased aerosols),
- Plastic apron if splashing of blood, body fluids, excretions and secretions is anticipated

Conclusions

Though at present, the pattern of illness does not differ from that of seasonal influenza, the sheer volume of cases that is expected to occur could easily overstretch the already fragile and overburdened health services, and cause considerable suffering in human populations around the world. It is a matter of much concern that while the novel virus is at present causing a mild disease in most cases, the next wave may be more severe. Larger numbers of severely ill patients requiring intensive care are likely to be the most urgent burden on health services, creating pressures that could overwhelm intensive care units and possibly disrupt the provision of care for other diseases. This calls for an enhanced surge capacity of health or medical services in each country to enable the health facilities to clinically manage an increased patient load in the future and keep the rate of fatality low. Although, the role of antivirals and vaccines is indisputable, the limited supply and lack of access in most developing countries can undermine the response capacity of the region and hence, enhance these countries' vulnerability in an emergency situation.

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