AN UPDATE ON “SWINE FLU” INFLUENZA H1N1 VIRUS

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ABSTRACT

This review discuss about viral infection commonly referred to as “swine flu” which has been reported to spread from one person to another by direct or indirect physical contact. In the past, transmission was limited but now days; transmission of this virus is rapid as it is spreading through air. Influenza A virus has been circulating worldwide resulting serious illness and deaths globally. This cross species infections (from swine flu virus to man and human flu virus to pigs) have found in local areas and did not cause severe infections in either pigs or humans. However, this cross-species found to have the potential to change. Investigators named it as "swine flu" strain. It was first time seen in Mexico, and 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). In India, swine flu virus that speeded since mid of December, 2014 shows amino acid mutations. More than 33,761 people are infected by H1N1 virus in India and around 2,035 of infected people died in March, 2015 reportedly. This review includes symptom, history, transmission, preventions and treatment, current status in India.

KEYWORD: Swine flu, Influenza H1N1 virus, Influenza A virus, current status is India.

INTRODUCTION

Swine flu is a respiratory disease caused by RNA virus (Influenza virus) that infect the respiratory tract of pigs resulting cough, confusion, nasal secretions etc. swine flu produces most of the similar symptoms in pigs as human flu produces in people. Only people who are closely associated with pigs were observed to developed flu in the past. In most circumstances, the cross-species infections i.e., swine flu virus to human, and human flu virus to pigs have remained in local areas and have not caused worldwide infection in either pigs or
in humans. Incrably, cross-species conditions with viruses has had the potential to change, researchers concluded the 2009, so called “swine flu”. In 2009, swine flu outbreaks was due to infection with the H1N1 virus & was first observed in Mexico.\textsuperscript{[1,7]} The most serious complications of this flu is pneumonia, which can be disastrous. Influenza flu is different from a common cold and other seasonal infections; many times it appeared as Influenza like Illness (ILI) which essentially includes fever, dry cough, nasal congestion, muscle pain, headache and also stomach symptoms such as nausea, vomiting, and diarrhea have reported in some people.\textsuperscript{[2]}

Swine flu, also known as Pig flu, Hog flu and Pig influenza. \textbf{Swine influenza virus (SIV)} or \textbf{swine-origin influenza virus (S-OIV)} is any strain of the influenza family that is endemic in pigs.\textsuperscript{[3]} As this flu is a seasonal flu, typically begin in late month of November and lasts through early spring.\textsuperscript{[4]}

\section*{SIGNS & SYMPTOMS\textsuperscript{[5]}}

\begin{enumerate}
\item \textbf{Uncomplicated Influenza}
\begin{itemize}
\item Sneezing, coughing
\item Fever (Temperature greater than 100°F or 37.8°C.
\item Sore throat
\item Convulsions
\item In addition vomiting (25%) and Diarrhea (25%) have been reported
\end{itemize}
\item \textbf{Severe influenza}
\begin{itemize}
\item Breathing problems(trouble/fast breathing)
\item High fever and dry cough
\item Persistent vomiting and diarrhea
\item Muscle pain
\item Weakness
\item Confusion
\item Low blood pressure
\item Bluish skin color
\end{itemize}
\end{enumerate}

\section*{WHO ARE AT RISK?}
\begin{itemize}
\item Elder people (65 years or above)
\end{itemize}
Diabetics patients
- Cancer patients
- Asthma patients
- Patients with Kidney problems
- Immunosuppressant
- Individuals with Hematologic disease
- Individuals with Congestive cardiac failure
- Pregnant women.\(^6\)

**INFLUENZA VIRUS**

Influenza viruses are roughly spherical in shape. Viral infection of the flu affects the respiratory system is generally accompanied by fever. The influenza virus types i.e. type A,B and type C are enveloped RNA viruses with a segmented genome; this means the viral RNA of the genetic code is not a single strand RNA but exists as Eight different RNA segments in the Influenza Viruses.

![Fig.1 Influenza gene](image)

**Influenza viruses are of 3 types**

1. **INFLUENZA TYPE A**
   
   Type A influenza is an infection of birds (H5N1) also known by “avian flu or “bird flu”. Swine flu is an infection caused by Influenza virus A&C. Variants of influenza can also infect humans. These viruses have capability of gradual mutations to change their antigenic characteristics. Influenza A is divided into subtypes based on the type of two surface proteins – Hemagglutinin (H) & Neuraminidase (N).
2. INFLUENZA TYPE B
This type of influenza virus undergoes only surface proteins (antigenic drift) & cause more localized epidemics.

3. INFLUENZA TYPE C
These type of viruses is anti-genially stable and cause only sporadic disease.[7,8,9,10,11]

HISTORY
Swine influenza was first proposed to be a disease related to human influenza during the 1918 flu pandemic. When pigs became sick at the same time as humans.[12] The H1N1 form of swine flu is one of the descendants of the strain that caused the 1918 flu pandemic.[13]

Influenza A virus is the stronger strain that causes human illness. Swine influenza is caused by influenza A subtypes H1N1[14], H1N2[14], H2N3[15], H3N1[16] and H3N2. In pigs, four influenza A subtypes (H1N1, H1N2, H3N2 and H7N9) are the most common strains worldwide and spreads in the same way that regular seasonal influenza viruses spread, mainly through cough, sneezes of the people who are sick with the virus.[17]

The year 2003 witnessed the appearance of a new avian Influenza A subtype (H5N1), which caused 844 cases and around 449 deaths in 16 countries. In India, by 20 March 2015, according to the data released by the Health Ministry, 31,974 cases had been reported and 1,895 people had died to the influenza A virus.[18]

INFLUENZA PANDEMICS (1918-1919)
Influenza H1N1 caused an estimated 20-50 million deaths worldwide and accounted for 675,000 deaths and the U.S. The most striking characteristics of the 1918 pandemic were the unusually high death rate among the otherwise healthy age group of 15-34 years old.[10] Around 1918, the ancestral virus of avian origin, crossed the species boundaries and infected humans as human H1N1.[19]

ASIAN FLU (1957)
After the influenza pandemic of 1918, influenza went back to its usual pattern of regional epidemics of lesser virulence in the 1930s, 1940s, and early 1950s. With the first isolation of a virus from humans in 1933[20]. There was a reassortment event leading to the development of a new strain; Influenza H2N2 begins in China in February, 1957; by June 1957 it spread to
United States, causing 70,000 deaths. The initial outbreak occurred during the summer of 1957 and again during January/February 1958.\[10,19\]

**HONK KONG FLU (1968)**

Influenza H3N2 started in Hong Kong in early 1968 and later in the year, it spread to the United States caused 34,000 deaths. By September 1968, the flu reached India, the Philippines, northern Australia and Europe. The Hong Kong flu was the mildest pandemic of the 20th century.\[10,21\]

**U.S. ZOONOSIS OR VARIANT OUTBREAK (1988)**

A swine flu virus killed one woman and infected others in September, 1988. A 32-year-old woman, Barbara Ann Wieners, was eight months pregnant when she and her husband, Ed, became ill after visiting the hog barn at a county fair in Wisconsin. Barbara died eight days later, after developing pneumonia. The only pathogen identified was an H1N1 strain of swine influenza virus. Doctors were able to induce labor and deliver a healthy daughter before she died. Her husband recovered from his symptoms. Doctors were able to induce labor and deliver a healthy daughter before she died. Her husband recovered from his symptoms.

When viruses of subtype A (H3N2) circulating in swine, began to infect people in the USA in 2011, they were labeled “variant” (with a “v” placed after the name of the virus). The variant terminology is also used for other non-seasonal influenza viruses of a subtype shared with human seasonal influenza viruses, particularly viruses of the H1 and H3 subtypes circulating in swine, when these viruses are detected in humans. Other animal viruses, e.g. avian influenza A(H5N1), A(H7N7), A(H7N9), and A(H9N2), infecting people are simply called “avian influenza2” or “zoonotic influenza” viruses.

Influenza-like illness (ILI) was reportedly widespread among the pigs exhibited at the fair. Of the 25 swine exhibitors aged 9 to 19 at the fair, 19 tested positive for antibodies to SIV, but no serious illnesses were seen.\[11,22,23,24\]

**U.S. SWINE OUTBREAK (1998)**

In 1997 a cluster of human cases due to avian influenza virus, H5N1 occurred in Hong Kong raising concerns that this foreshadowed the beginning of a pandemic. Fortunately, the virus lacked the ability to be efficiently transmitted in human population. Influenza A predominated in 1998, only 2% of cases were influenza B. The measure of influenza illness
in the community was lower in 1998 than in the years 1995 to 1997 according to general practitioner surveillance.\[25\]

**FLU PANDEMIC (2009)**

On June 11, 2009, in response to the global spread of a new strain of H1N1 influenza (“flu”), the World Health Organization (WHO) declared the outbreak to be a flu pandemic, the first since 1968\[26\]. By the World Health Organization's official tally, the flu pandemic of 2009-10 killed 18,449 people around the world. Those are deaths of people who had laboratory-confirmed cases of the so-called swine flu.\[27\]

**INFLUENZA VIRUS (2011-13)**

The 2010-2011 season was less severe than the 2009-2010 pandemic season and the 2007-2008 season, but more severe than the 2008-2009 season. Although influenza A (H3N2) viruses predominated in the United States during the 2010-2011 season, high levels of 2009 influenza A (H1N1) and influenza B viruses circulated as well. In comparison to other seasons, the 2011-2012 seasons set a new record for the lowest and shortest peak of influenza-like illness. During the 2011-2012 season, the highest rates of hospitalizations were in people 65 years and older (30 per 100,000) and in children 0-4 years old (14 per 100,000).\[28\]

**FLU SEASON (2014)**

During the 2013-2014 seasons, influenza A (H3N2), 2009 influenza A (H1N1), and influenza B viruses circulated in the United States. As of August 16, 2014, more than 105 flu-related deaths in children were reported to CDC from 30 states.\[28\]

**TRANSMISSION**

The main transmission of flu viruses from person to person is through coughing or sneezing. Influenza virus enters the body through the mucous membrane – the eyes, the nose or the mouth. Its goes from person to person through indirect or direct contact, close contact or respiratory droplets that carrying the virus. When an infected person coughs or sneezes, the flu viruses are carried in large droplets which settle on the surfaces of the upper respiratory tracts of persons who are nearby (i.e. within three feet of the infected person). When anybody sneezes without covering their nose and mouth with a tissue or handkerchief, flu virus spreads. If anybody sneeze or cough into one’s hand, those droplets and the germs in them are then easily spread from his hand to any hard surface that person touch i.e., everyday items
such as door handles, computer keyboard, cellular phone, ordinary phone and TV remote control are all common surfaces where, flu viruses can be found. If other people touch these surfaces and then touch their faces, the germs can enter their systems, and they can become infected.\textsuperscript{[10,29,30]}

Influenza viruses are not spread by food. You cannot get swine influenza from eating pork or pork products. Eating properly handled and cooked pork products is safe.

**PREVENTION**

Influenza spreads between humans when infected people cough/sneeze, then other people breathe in the virus or touch something or surface with the virus on it and then touch their own face.\textsuperscript{[31,32]} Novel virus flu can be prevented with or without vaccines. Prevention of flu without vaccine is mainly to avoid exposure or contact to the virus.

There are also everyday actions that can help to prevent the spread of germs that cause respiratory illnesses like the flu-

1. Wash your hands regularly with soap and warm water at least for 15-20 seconds and rinse thoroughly.
2. If soap and water is not available, you can use alcohol based gel/hand sanitizers instead to kill viruses and germs.
3. Cover your mouth and nose with a tissue when coughing/sneezing. After use, put it in the trash and clean your hands just after cough/sneeze.
4. Avoid over-crowded places, contact with sick people who are already infected. Many flu virus droplets can travel only about 3-4 feet. So, it is advised that one should maintain a distance of 6 feet.\textsuperscript{[33-35]}

**TREATMENT**

**Ayurvedic formulations**

The Ayurvedic treatment of swine flu is aimed at treating the symptoms, controlling the virus, and preventing complications by boosting the immune status of the body. Medicines like Tribhuvan-Kirti-Ras, Sitopaladi-Churna, Triphal-Guggulu, Maha-Sudarshan-Churna, Shwas-Kuthar-Ras, Laxmi-Narayan-Ras, Sut- Shekhar-Ras, Samshamani-Vati, Dhatura (Dhaturafastiosa) and Vishwa (Zinziberofficinalis) can be used to treat the flu-like symptoms of fever, bodyache and cough.\textsuperscript{[36]}
Antiviral agents for Influenza

In the United States, four antiviral agents are approved for preventing or treating influenza: amantadine, rimantadine, zanamivir and oseltamivir. Testing of influenza A isolates from the United States and Canada has demonstrated that most of these viruses are resistant to amantadine and rimantadine.

Zanamivir and oseltamivir are members of a class of drugs called neuraminidase inhibitors and are active against both influenza type A and type B. Zanamivir is provided as a dry powder that is administered by inhalation.

Oseltamivir is provided as an oral capsule. It is approved for the treatment of uncomplicated influenza. Oseltamivir should be used alone only if recent local surveillance data indicate that circulating viruses are likely to be influenza A (H3N2) or influenza B viruses, which have not been found to be resistant to oseltamivir. As of 2013 seasonal viruses are almost 100% susceptible to oseltamivir as well as zanamivir. Antiviral agents for influenza are an adjunct to vaccine and are not a substitute for vaccine. Vaccination remains the principal means for preventing influenza-related morbidity and mortality.\textsuperscript{[34]}

Peramivir: A third neuraminidase inhibitor peramivir formulated for intravenous (IV) administration is an investigational product currently being evaluated in clinical trials.\textsuperscript{[37]}

CURRENT STATUS IN INDIA\textsuperscript{[38]}

By 20 March, according to the data released by the Health Ministry, 31,974 cases had been reported and 1,895 people had died to the disease.
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<table>
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<tr>
<th>STATE</th>
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<td><strong>Total</strong></td>
<td><strong>42,437</strong></td>
<td><strong>2,798</strong></td>
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CONCLUSION

Swine flu is a respiratory disease caused by influenza viruses that infect the respiratory tract of pigs and result in nasal secretions, a barking cough, decreased appetite and listless behavior.[39] More than 33,761 people are infected by H1N1 virus in India and around 2,035 of infected people died in March, 2015 reportedly. This review article covered the history, transmission, prevention, precautions, treatment and current status of swine flu virus in India. H1N1 is an Influenza A virus. Swine Flu is caused by influenza viruses, and is spread mainly by coughing, sneezing, and close contact. Prevention and control measures for swine influenza are based on our understanding of seasonal human influenza and consideration of potential modes of transmission.[40]
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