

## General Article

### Human infection with pandemic Influenza (H1N1): A Review Article

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#### Abstract

*Swine flu, also known as the H1N1 virus, is new strain of an influenza virus that causes symptoms similar to the regular flu. It originated in pigs, but is spread rapidly from person to person. Therefore, the objectives of this article are to highlight on H1N1 Influenza, its mode of transmission, risk factor, clinical spectrums and preventive ways. Studies published relevant to swine flu was searched through scientific databases like MEDLINE, Pubmed and online search engines like ‘Google Scholar’. Eligible studies involved at least one factor related to ‘influenza A virus’, ‘H1N1 subtype’, ‘epidemiology’, ‘transmission’ and ‘preventive measures’ etc. Searches were limited to human only and also looked at the websites of the leading health authorities (e.g. WHO, CDC, HPA). Swine is a new flu virus that appears in human and spreads very quickly from person to person. In Nepal, the first case was detected on June 2009 after that the case is increasing day by day. In 2010 till May there were 172 confirmed positive cases, likewise on August 7, 2017 there were 10 death and 354 positive cases of swine flu in Nepal. Therefore, Government of Nepal has broadcasted awareness programs, organized seminars and meetings, to make people aware regarding H1N1 Influenza. But, it seems challenging to decrease its outbreak in Nepal because of low financial resources, low manpower, limited technology and political instability.*

**Keywords:** Human influenza, pandemic, swine flu

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## **Introduction**

Swine flu has been creating a terror effects all-round the globe. Swine flu refers to viral infection caused by influenza virus A, and its sub-types. H1N1 virus is a new swine flu virus and it contains the genetic material of swine, bird and human influenza virus (Jadhav, 2017). Like all influenza viruses, swine flu viruses change constantly. When influenza viruses from different species infect pigs, the viruses can reassort (i.e. swap genes) and new viruses that are a mix of swine, human and/or avian influenza viruses can emerge (Mukherjee, Sen, Nakate, & Moitra, 2015).

The advance of human civilization has brought people, plants, animal and microbes together. Nowadays, the rate of International travel and commerce also increasing which drives the rapid, global distribution of microbial pathogens and the organism that harbors them (Mack, Choffnes & Relman, 2010). .

Because of aerosol transmission swine flu now become one of the fastest spreading influenza in the world, which affects the many countries in a short period of time. Unavailability of vaccine, unavailability of antiviral drugs, inadequate information regarding prevention and control of swine flu and high treatment cost are the greater threat to the developing countries for its prevention and control.

## **Historical perspective**

Swine influenza virus caused by Orthomyxo virus endemic to pig populations. It is a highly contagious respiratory disease of pigs caused by type A influenza that regularly cause outbreaks of influenza among pigs<sup>1</sup> Such virus, namely, Influenza A H1N1 virus has the capacity to cross species barrier (i.e., pig to humans) and has spread widely amongst humans. This led to a pandemic situation covering nearly the entire globe with a significant pace in terms of spread (Arora et.al, 2011).

If we see the history of influenza pandemics, there were three devastating pandemics in 1918, 1957 and 1968, caused by H1N1 (Spanish flu), H2N2 (Asian flu) and H3N2 (Hong Kong flu) (Taubenberger, 2006). During that period, excess mortality was noted in infants, elderly and

persons with chronic diseases with a peak of excess death among young adults aged between 20 and 40 years. After that, the influenza A (H1N1) virus was not identified in humans again until 1977. In 1977, the H1N1 virus re-emerged in China, Hong Kong and the former Soviet Union with relatively milder effects (Hsieh et.al, 2006).

### **Effect of Influenza A (H1N1) virus on 21<sup>st</sup> Century**

Influenza is an acute viral disease of the respiratory tract that annually produce greatest global burden with high morbidity, mortality, social and economic disruption. The swine-origin influenza A (H1N1) virus was first found in human beings in Mexico in March 2009 and spread through the traveller's worldwide (World Health Organization, 2009). During December 2005 to January 2009, 12 cases of human infection with swine influenza were reported; five of these 12 cases occurred in patients who had direct exposure to pigs, six patients reported being near pigs, and the source of infection in one case was unknown (Centers for Disease Control and Prevention, 2010).

A clinical guidance WHO (2009) reported that till 12 May 2009, 30 countries had officially reported influenza A (H1N1) virus infection with 5251 confirmed cases. Of these cases, 5030 (95.8%) were reported from American Region, 204 (3.9%) from the European Region and 17 (0.3%) from the Western Pacific Region. Likewise, 61 deaths related to influenza A (H1N1) virus infection have been reported from 4 countries: Mexico the death rate is 56, United States the death rate is 3, Canada and Costa Rica the death rate is same that is 1. Similarly, in 6 July 2009, nearly 95 000 cases and 429 deaths were reported from 135 countries (World Health Organization, 2009). Likewise the data from 13 November 2017 to 26 November 2017 among 99 countries reported 8982 were positive cases of influenza viruses, of which 5617 (62.5%) were typed as influenza A and 3365 (37.5%) as influenza B. Regarding the sub-typed 1122 (33%) were influenza A (H1N1)pdm09 (World Health Organization, 2016). This data demonstrates that there is not one single country be affected only but globally as a whole.

In India the first confirmed case of influenza A (H1N1) was recorded in Hyderabad on May16, 2009 (Siddharth, Goyal & Koushal, 2012). In Oct 2013, there were over 13,000 cases of swine

flu reported with 444 deaths. During 2014 swine flu had swallowed the lives of more than 1,000 people and 20,000 people were affected by this virus. In 2015, as many as 1,731 deaths out of 30,000 documented cases had been reported in India. In Pakistan, the ministry of health of Pakistan confirmed the country's first swine flu case On August 10, 2009. In Muslim country like Pakistan there is no swine source of virus, but the only source is, the migrant people from abroad (Qasim, 2016).

In Nepal, the first case was detected among people returning from the US on June 2009. According to National public health laboratory report, till May 2010, there was 172 confirmed positive cases. Out of them, 36 cases were recorded before declaration of Community transmission, 29 Nepalese citizens residing within the country, 2 foreigners and 5 close relatives of confirmed positive cases. Remaining 136 cases were found after community transmission. After the community outbreak, most of the swine flu cases were found from Kathmandu district followed by Kaski and Chitwan. All the confirmed cases of Pandemic influenza A/H1N1 were in the range of age group from 1-74 (Adhikari, Shakya, Upadhyay Shrestha & Dhungana, 2011).

In Nepal swine flu outbreaks were reported in the spring of 2015. On April 21, 2015 it is reported that there were 26 affected people lives in the most severely affected district, Jajarkot. Cases also detected in the districts of Kathmandu, Morang, Kaski, and Chitwan. As of 22 April 2015 the Nepal Ministry of Health reported that 2,498 people had been treated in Jajarkot, of whom 552 were believed to have swine flu (Jadhav, 2017). According to Sentinel Human Surveillance for Human Influnza, Nepal on 16 august 2017 reported that in Western Regional Hospital (WRH), among the 529 suspected specimens 282 cases were flu A/H1 pdm09, 7 cases were flu A/H3 and 26 cases were flu B.

Influenza timing generally followed historical trends in most regions except in Europe and east Asia, where the seasons commenced and peaked earlier than usual. In China, Japan, Mongolia and the Republic of Korea, influenza activity increased towards the end of 2016 and peaked in December 2016 or January 2017. Influenza activity in China often has 2 peaks during the year, with the winter peak often greater than the summer peak, However, during this reporting period, the larger peak occurred in July (World Health Organization, 2016).

### **Classification of influenza Virus**

The Orthomyxoviruses are Spherical viruses' 80-120 nm in diameter and classified into three types of Orthomyxoviridae family: A, B, C on the basis of variation in the nucleoprotein antigen they have. Type A influenza viruses are further divided into subtypes according to the specific proteins that occur on the surface of the virus. These proteins are called hemagglutinin (HA) and neuraminidase (NA). There are 15 different HA subtypes and 9 different NA subtypes, among them influenza A subtypes (i.e., H1N1, H1N2, and H3N2) are common among people (White, White, & Fenner, 1994).

### **Mode of transmission**

Influenza virus spread through inhalation of small particle aerosols, large droplet infection, direct contact, or by contact with articles recently contaminated by nasopharyngeal secretions (Centers for Disease Control and Prevention, 2010).

The incubation period for influenza usually ranges from one to three days, typically two days. The period of communicability for influenza virus is during the 24 hours before the onset of symptoms, and during the most symptomatic period, usually three to five days from clinical onset in adults and up to seven days in young children and severely immunocompromised persons can shed virus for even longer (Blumberg, Cohen & Dawood, 2017).

Likewise viruses can survive for 24-48 hr on hard, nonporous surfaces such as stainless steel and plastic but survived for less than 8-12 hr on cloth, paper, and tissues. Measurable quantities of influenza A virus can transfer from stainless steel surfaces to hands for 24 hr and from tissues to hands for up to 15 min. On hands virus can survive for up to 5 min after transfer from the environmental surfaces. The days of survival of virus increases under conditions of low humidity and in the cold (Centers for Disease Control and Prevention, 2010).

### **Risk Factor**

Presently the world is under the threat of an influenza virus but, there are specific groups who are high risk for illness, they are: Pregnant women (including the post-partum period), HIV-infected

individuals (Centers for Disease Control and Prevention, 2010). Individuals with tuberculosis , Persons of any age with chronic diseases like Pulmonary diseases (e.g. asthma, COPD) , Immunosuppression (e.g. persons on immunosuppressive medication, malignancy) , Cardiac diseases (e.g. congestive cardiac failure), except for hypertension, Metabolic disorders (e.g. diabetes) , Renal disease o Hepatic disease , Neurologic and neurodevelopmental conditions, Haemoglobinopathies (e.g. sickle cell disease) , Persons aged  $\geq 65$  years , Persons  $\leq 18$  years receiving chronic aspirin therapy, Persons who are morbidly obese (i.e. BMI  $\geq 40$ ), Young children (particularly  $<2$  years of age) etc(Blumberg,Cohen, & Dawood, 2017).

### **Clinical presentation**

The Influenza virus symptoms may be self-limited mild-to-moderate uncomplicated disease to severe complications including fatal outcomes. Patients may have present initially with uncomplicated influenza may progress to more severe disease. Progression can be rapid (i.e. within 24 hours). Shortness of breath (with activity or at rest), difficulty in breathing cyanosis, bloody coloured sputum, chest pain, and low blood pressure, altered mental status, unconsciousness, drowsiness, seizures, paralysis are the symptoms of disease progression (World Health Organization , 2009).

The uncomplicated influenza illness resolves after 3-7 days although cough and malaise can persist for  $>2$  weeks. Others symptoms include Influnza like illness (ILI) like fever, cough, sore throat, rhinorrhea, headache, muscle pain, and malaise, but no shortness of breath and no dyspnoea. Gastrointestinal symptoms like diarrhoea and/or vomiting, especially in children, but without evidence of dehydration may be present ('World Health Organization , 2009).

Complicated or severe influenza symptoms may include: influenza-associated pneumonia/ LRTI, multi-organ failure. Rare complications include encephalopathy, myocarditis, pericarditis and Reye syndrome (World Health Organization , 2009). The study conducted at India among 442 H1N1 positive patients reveal that the overall mortality rate was 1.8% and the most common cause of death in patients was due to pneumonia. Fever (95.4%) was the most common clinical manifestation followed by cough (82.32%), breathlessness (32.8%) and sorethroat (26.7%) (Puvanalingam et.al, 2011). <sup>17</sup>.

### **Antiviral Drugs for Influenza**

Timely diagnosis and early recognition of an influenza outbreak can prevent the influenza-related complications, hospitalizations, and deaths. Uncomplicated seasonal influenza is benefited by antiviral treatment commencing within 48 hours of onset of symptoms. Oral Oseltamivir (Tamiflu®) and inhaled zanamivir (Relenza®) are chemically related antiviral medications that act as neuraminidase inhibitors and have activity against both influenza A and B. Antiviral treatment should be maintained without a break until virus infection is resolved or there is satisfactory clinical improvement (World Health Organization, 2017). Other interventions includes Antibiotic treatment for reducing the risk of pneumonia and should maintain SaO<sub>2</sub> >90%. High flow oxygen may be required in severe cases (Blumberg, Cohen & Dawood, 2017).

### **Public health measures to limit transmission**

Preparedness, early detection and outbreak response are critical elements in limiting the spread of seasonal and pandemic influenza at the local, national, and global levels (WHO, 2010). Influenza vaccination is the most effective method for prevention and control of influenza infection. Influenza vaccine takes about 2 weeks to develop protective antibody response and the best time for vaccination is before the influenza season starts. The inactivated influenza vaccine (IIV) should be administered intramuscularly, 0.5ml, single dose for adult. The recommended inactivated influenza vaccines are A/Michigan/45/2015 (H1N1) pdm09-like viruses, an A/Hong Kong/4801/2014 (H3N2)-like virus (Puvanalingam et.al, 2011).

Preventing the transmission of influenza is best achieved through strict compliance with routine practices. Avoid close contact to the person who is risk for severe influenza, use of facemask/N95 respirator also reduce the risk of influenza transmission. Maintain distance of minimum 6 feet from people having ILI. Strict adherence to hand washing after coughing, sneezing or keeping hands away from the mucous membranes of the eyes and nose are the cornerstone of infection prevention<sup>2</sup>. 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 falling sick or at least 24 hours after symptoms have resolved whichever is longer. Wipe

down surfaces that are frequently touched or shared (doorknobs, remote controls) with a standard household disinfectant (Centers for Disease Control and Prevention, 2016).

The Government of Nepal prepared strategic plan, “National Preparedness and Response Plan for Pandemic Influnza and Other Public Health Emergencies” and “ Standard operating Procedure for influenza surveillance system in Nepal” to fight against ongoing health threats through disease surveillance, laboratory detection, epidemiologic investigation and responding rapidly during outbreaks. But, it seems challenges to implement a plan in Nepal because of open border between India Nepal, small rural and backward mix animal farming, limited financial resources, low manpower and limited technology as well as political instability.

## **Conclusion**

The present review concluded that H1N1 virus is becoming a global threat because of fast moving influenza associated with high mortality rate related to their infections. Swine flu, also known as the H1N1 virus, is a relatively new strain of an influenza virus that causes symptoms similar to the regular flu. It originated in pigs but it spread primarily from person to person. It affects the people of all ages, children to older people weakening immunity. The flu can be prevented by conducting awareness programs and using antiviral therapy and vaccines. Therefore Ministry of Health, Nepal should play crucial role on early detection and management of pandemic Influenza, actively implementation of National Influenza Pandemic Preparedness Plan according to WHO guidelines. The Ministry of Health should also additionally launch seasonal flu vaccination programs on time to the vulnerable groups.

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