Novel Swine Influenza A/H1N1 and the Phase Six Pandemic

Khadka M¹

¹Department of Microbiology, Lumbini Medical College, Pravas, Tansen, Palpa, Nepal.

ABSTRACT

The family Orthomyxoviridae consists of Influenza A virus which is negative sense single stranded virus. The genome of the virus is segmented and possesses a peculiar trait of genetic reassortment. The influenza virus on its envelop consists of the antigenic glycoprotein like haemagglutinin (HA) and neuraminidase (NA). The changes in those glycoprotein components due to antigenic shift and antigenic drift leads to the development of new strain of Influenza A viruses.

Now the novel swine influenza A/H1N1 strain has been detected from different parts of the world which is causing pandemic. World Health Organization has declared the pandemic phase six and more than 60 countries have reported the cases of novel influenza A/H1N1 strain including Nepal.

As the disease is spreading world wide, it is a major public health concern for all the countries. And especially the developing countries like Nepal should immediately respond to the situation and should be well prepared to combat the disease before the disease spreads to enough population.

Keywords: pandemic, public health, reassortment, swine influenza A/H1N1

INTRODUCTION

Orthomyxoviridae family consists of four genera-Influenza A, Influenza B, Influenza C and Thogotovirus.^{1,2} It consists of segmented, negative sense RNA and is enveloped. Influenza A virus can be further divided into various subtypes on the basis of antigenic characters possessed due to presence of surface glycoproteinshaemagglutinin (HA) and neuraminidase (NA).³ Influenza A has 16 HA and 9 NA subtypes which can recombine to form new combination of influenza subtypes.⁴ Ducks and waterfowl birds are the principal natural hosts of influenza virus.⁵ The influenza is transmitted to the other species from this natural host and the swine plays the vital role in the epidemiology of influenza.⁶ Influenza virus has a unique ability of causing recurrent epidemics and truly global pandemic with acute febrile respiratory disease in all age groups. The virus can undergo genetic reassortment and relatively rapid and unpredictable antigenic changes.⁷

PREVIOUS INFLUENZA PANDEMICS

History suggests that the pandemic like events were reported as early as the 5th century BC by Greek physicians Hippocrates. The thirty one outbreaks have been reported since the first pandemic described

Correspondence:

Mr. Manoj Khadka Department of Microbiology Lumbini Medical College Pravas, Tansen, Palpa, Nepal. Email: cyclonemanoz@gmail.com Phone: 9847122699

255

in 1580.⁸ Three major pandemics of influenza of the last century were Spanish flu (H1N1) 1918, Asian flu (H2N2) 1957 and Hong Kong flu (H3N2) in 1968.⁹

SPANISH FLU: 1918-1919

The influenza pandemic which occurred in 1918 was the most devastating pandemic in the modern history. Despite its high incidence in Spain, the pandemic was called "Spanish flu". The pandemic was started in North America in March and crossed the Atlantic to Europe till April. The virus that caused pandemic of 1918 is believed to have originated from pig.¹⁰ From 1918-1919, the waves of influenza outbreaks resulted in nearly 21 million deaths across the world out of which half a million were in United States of America.

ASIAN FLU: 1957-1958

The influenza strain H2N2 caused the pandemic of 1957. This influenza pandemic originated from China during February and reached to Hong Kong in the middle of April. It was estimated that two million deaths occurred globally.¹¹ The pandemic caused 70,000 deaths in the United States alone. Since 1968, this strain hasn't circulated in human so the people under 30 years old are not immune to this strain.¹²

HONG KONG 1968-1969:

The pandemic of 1968 was caused by H3N2 strain of influenza A virus. The first outbreak of acute respiratory disease was reported by newspaper in United Kingdom during mid July. In the same month, the disease spread to Hong Kong with maximum intensity. The returning troops from Vietnam spread disease to USA. In United Kingdom the epidemic began in December. Global mortality was estimated to be around one million. Several countries experienced epidemics only at the beginning of 1969.¹⁰ H3N2 viruses still circulate today.¹²

SWINE INFLUENZA

Swine influenza is caused Influenza virus type A and is common respiratory disease in pig. Swine influenza virus subtypes H1N1 and H3N2 has re-emerged as important viral pathogens in swine causing primary disease and as a part of porcine respiratory disease complex (PRDC). Swine influenza is an acute respiratory disease of pig characterized by sudden onset, coughing, dyspnea, fever and rapid recovery.¹³ Swine influenza virus (SIV) is a zoonosis and pigs act as a "mixing vessel for genetic reassortment of human and avian viruses.⁶ The double (avian/human) and triple (avian/human/swine) assortment had occurred in influenza A viruses isolated from pigs in the United States or China.¹⁴

The swine producers, world wide have faced a major economic loss because of the swine influenza.¹⁵

Normally the swine influenza virus doesn't infect humans but sporadic cases have been found. However, the persons with direct exposure to pigs are vulnerable to infection.⁹

The classical swine influenza virus (influenza A H1N1) was first isolated in 1930 by Shope and Lewis.^{12,16} The illness after outbreak of influenza in the swine herd and their families was first observed by veterinarian J. S. Koen.¹⁷ The speculation that the swine-origin influenza virus could infect human was confirmed by isolation of swine influenza virus from human in 1974.¹⁸ The co-infection of pig with human and avian influenza virus makes the suitable meeting point for two different strains.

NOVEL INFLUENZA A/H1N1 AND HUMAN

Swine flu is contagious and is spreading from human to human.¹⁹ Most of the cases of novel A (H1N1) has been characterized by mild influenza like illness (fever, chills, headache, upper respiratory infection symptoms, myalgias, arthralgias and fatigue) similar to those of typical seasonal influenza. The incubation period ranges from two to seven days.²⁰ Certain populations like children younger than five years, 65 years and older, pregnant women and people with certain chronic medical conditions (asthma, diabetes etc) are at the higher risk of serious flu related complications in case of seasonal flu. But in novel H1N1 related flu, the adults older than 64 years do not appear to be at increased risk. It has also been reported that no children and few adults younger than 60 years old have existing antibody to novel H1N1. But one third of adult older than 60 years may have antibodies against the virus.¹⁹

SWINE FLU 2009: THE PHASE SIX PANDEMIC

According to World Health Organization, the influenza pandemic has been scaled into six phases and two other phases- post peak period and post pandemic period.²¹ A "Phase six Pandemic" is defined as "an increased and sustained transmission in the general population" and would threaten up to half of the world's population.¹⁴ The illness of the disease depends on the virulence of virus though the future influenza pandemic would spread from community to community.²²

According to the first update of WHO on 24 April 2009, the United States Government had reported seven confirmed human cases of Swine Influenza A/H1N1 in the USA (five in California and two in Texas). All the confirmed cases had mild Influenza- Like Illness (ILI), with one requiring brief hospitalization. However no death was reported. In Mexico, three separate events of Influenza Like Illness (ILI) were reported. Till 23 April 2009, 854 cases of pneumonia were reported from the capital city of Mexico. Of those 59 had died. Eighteen of the Mexican cases were laboratory confirmed in Canada as Swine Influenza A/H1N1, while 12 of those were genetically identical to the Swine Influenza A/ H1N1 viruses from California.²³

The Swine Influenza spread from Mexico and the USA to several other countries like Canada, New Zealand, the United Kingdom, Israel and Spain. It was recommended to all the people to delay the international travel for the people who were ill. And it was also declared that there were no possible risk of infection from this virus from consumption of well coked pork and pork products. Individuals were advised to wash their hands thoroughly with soap and water on regular basis and seek medicine if they develop any symptoms of influenza like illness.²⁴

Till 29 May 2009, 53 countries officially reported 15,510 cases of influenza A/H1N1 infection including 99 deaths.²⁶ According to WHO update 42, nine more countries suffered from the pandemic till 1 June 2009 and total of 17,410 cases of influenza (A/H1N1) was reported from 62 countries including 115 deaths.²⁶

Following the Director General statement, the WHO Emergency Committee meeting held on June 11 2009 decided to raise the level of influenza pandemic alert from the phase five to six. This action was the reflection of the spread of the new H1N1 virus, not the severity of illness caused by the virus. More than 70 countries had reported cases of novel influenza A/H1N1 infection and there were community level outbreaks of novel H1N1 in multiple parts of the world.²⁷ Nepal has also confirmed the cases of swine flu. According to 15 July 2009 update of Zeenews India, 14 cases of swine flu infections have been confirmed by ministry of Health and Population, Nepal till date.²⁸

CONCLUSIONS

The novel influenza virus (A/H1N1) has been circulating in North America largely after the peak influenza transmission season so the severity and epidemiology of upcoming influenza season in the southern or in the northern hemisphere cannot be predicted. However the imminent onset of the season for influenza virus transmission in the southern hemisphere coupled with detection of confirmed cases in several countries in the southern zone raise the concern that the spread of novel influenza A (H1N1) virus might result in largescale outbreaks during upcoming months. Therefore the countries in the southern hemisphere should anticipate outbreaks and enhance surveillance accordingly.²⁹ The pandemic of swine flu is spreading globally and gradually the new cases of swine flu have been reported from new countries. So it's a matter of public health concern to stop swine flu being spread to the new population.

The four key activities are suggested for the comprehensive public health approach: i) limiting the circulation of avian and other animal influenza viruses, ii) improving early warning, iii) strengthening pandemic preparedness and response activities, iv) strengthening and expanding control activities.⁸

REFERENCES:

- Klenk HD, Cox NJ. Orthomyxoviridae, Virus taxonomy, editors Murphy FA, Fauquet CM. 1995, Springer-Verlag, Vienna, p 293-299.
- ICTV Executive Committee 1966, Meeting of the executive committee 10-11 August 1996, Jerusalem, Israel.
- 3. Foni C, Chiapponi E, Fratta C, Garbarino C, Barigazzi G, Merenda M. Detection of swine influenza virus by RT-PCR and standard methods. Proceedings of the 4th International Symposium on Emerging and Re-emerging Pig Diseases; 2003 June 29-July 2; Rome, Italy. p 270-271.
- Galwankar S, Clem A. Swine Influenza A (H1N1) strikes a potential for global disaster. J Emerg Trauma Shock 2009;2:99-105.
- Webster RG, Bean WJ, Gorman OT, Chambers Tm, Kawaoka Y. Evolution and ecology of influenza A viruses. Microbiol Rev 1992;56(1):152-179.
- Scholtissek C, Hinshaw VS, Olsen CW. Influenza in pigs and their role as the intermediate host. In: Nicholson KG, Webster RG, Hay AJ editors. Textbook of Influenza. Blackwell Science, Oxford, 1998:137-145.

- Cox NJ, Kawaoka Y. Orthomyxoviruses: influenza. In: Collier L, Mahy BWJ, editors. Topley and Wilson's Microbiology and microbial infections. 9th edition. Oxford University Press Inc.1998. p 384-461.
- Lazzari S, Stohr K. Avian influenza and influenza pandemics. Editorials. Bull World Health Organ 2004 April;82(4):242-242A.
- National Institute of Allergy and Infectious Diseases (National Institute of Health). Pandemics and Pandemic Threats since 1900 [Online]. 2009 May 4; Available from: URL:http:// www.pandemicflu.gov/general/historicaloverview.html.
- World Health Organization. WHO report on global surveillance of epidemic-prone infectious diseases. WHO/ CDS/CSR/ISR/2001.p.89-92.
- World Health Organization. Avian influenza: assessing the pandemic threat WHO/CDS/2005.29. 2005;p 1-62. Available from: URL:http://www.who.int/csr/disease/influenza/ H5N1-9reaudit.pdf.
- Center for Disease Control Division. Key facts about Swine Flu [Online]. 2009 May 2; Available from:http://www.cdc. gov/h1n1flu/key_facts.htm.

- Morwska-Daniel I. Monitoring of swine influenza in Poland in the season 2001/2002. Proceedings of the 4th International Symposium on Emerging and Re-emerging Pig Diseases; 2003 June 29- July 2; Rome, Italy.p 277-278.
- Wenjun M, Robert EK, Juergen AR. The pig as a mixing vessel for influenza viruses: human and veterinary implications. J Mol Genet Med 2009;3(1):158-166.
- Scheidt A. Control of viral respiratory disease. Proceedings of the 15th IPVS (2002) Congress; 1998; Birmingham, England; p 27-31.
- Shope R, Lewis P. Swine Influenza: experimental transmission and pathology. J Exp Med 1931;54:349-359.
- Esterday, B. Swine influenza: historical perspectives. Proceedings of the 4th International Symposium on Emerging and Re-emerging Pig Diseases; 2003 June 29- July 2; Rome, Italy. p 2 41-244.
- Smith TF, Burgert EO Jr, Dowdle WR, Noble GR, Campbell RJ, Van Scoy RE. Isolation of swine influenza virus from autopsy lung tissue of man. N Engl J Med 1976;294:708-710.
- Center for Disease Control Division. Novel H1N1 flu (Swine flu) and you [Online]. 2009 June 30. Available from: URL:http://www.cdc.gov/h1n1flu/qa.htm.
- 20. Cheong HJ. Novel Influenza A (H1N1): Where are we? J Korean Med Sci 2009;24:361-362.
- 21. World Health Organization. WHO Pandemic phase description and main actions by phases. Global influenza

258

program [Online]. Available from: URL:http://www.who. int/csr/disease/influenza/GIPA3AideMemoire.pdf.

- 22. Editorials. Can influenza pandemic really be contained? Lancet 2006 Mar 18;367(9514):875.
- World Health Organization. Influenza like illness in the United States and Mexico, WHO Update 1 [Online]. 2009 April 24. Available from: URL:http://www.who.int/csr/ don/200_04_24/en/index.html
- World Health Organization. Swine influenza- WHO update 4 [Online]. 2009 April 28. Available from: URL:http://www. who.int/csr/don/2009_04_28/en/index.html.
- World Health Organization. Swine Influenza A/H1N1-WHO Update 41 [Online]. 2009 May 29. Available from: URL:http:// www.who.int/csr/don/200_05_29/en/index.html.
- World Health Organization. Swine Influenza A/H1N1-WHO Update 42 [Online]. 2009 June 1. Available from: URL:http:// www.who.int/csr/don/200_06_01a/en/index.html.
- 27. Center for Disease Control and Prevention (CDC). H1N1 (Swine flu) A pandemic threat is declared. 2009 July 17 Update. Available from: URL:http://www.cdc.gov/h1n1flu/.
- Swine flu: 5 more infected in Nepal, total rises to 14. 2009 July 15 update. Available from: URL:http://www.zeenews.com/ news547242.html.
- Novel influenza A (H1N1) virus infections worldwide, May 6 2009. MMWR Morb Mortal Wkly Rep may 8 2009;58(17):453-458.