

Review Article

Reemergence of Swine Flu H1N1 in India: First Outbreak of 2015

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***Corresponding author:** Husain M, Department of Biotechnology, Jamia Millia Islamia Central University, India**Received:** June 25, 2015; **Accepted:** September 24, 2015; **Published:** October 03, 2015**Abstract**

Influenza virus is an excellent player of hide and seeks, continuously appearing at least once in every year after 2009 pandemic, affecting all age groups around the globe. Spread of influenza infection is quick and fast as it transmits by aerosols released by the infected patients, thus not limited to any boundary. The novel virus H1N1 contains genome derived from human, pig and bird flu viruses, commonly known as swine flu shows the capacity to spread from human-to-human. The virus was first detected in USA and Mexico in March 2009 and later diffused all over the globe. People had no pre-existing immunity to the novel strain and globally it infected millions of population in just few months that allowed World Health Organization to announce an emergency and pandemic. At the end of the year 2009 more than 27 thousand positive cases with around 981 deaths were reported in India and threat continued in later years with severe morbidity and mortality. Again year 2015 begins with swine flu outbreak across the country and within two beginning months of the year, death toll crossed 1000 with positive cases reached around 20,000 and till 16 March, 2015 death cases reached around 1,731 with around 30,000 positive cases across the country.

Keywords: Influenza A; Reemergence; H1N1; India**Abbreviations**

HA: Hemagglutinin; NA: Neuraminidase; WHO: World Health Organization; NCR: National Capital Region; ILI: Influenza Like Illness; CDSCO: Central Drug Standard Control Organization; IDSP: Integrated Disease Surveillance Programme; ICMR: Indian Council of Medical Research

Introduction

Influenza A is a single stranded, negative sense RNA genome containing virus belongs to the family *Orthomyxoviridae* and responsible for acute respiratory illness in humans from last several decades. The Influenza A virus has marked distinguished severity among the three subtypes (Influenza A, B and C) and infects a variety of animals such as pigs, humans, sea mammals, horses and various bird species. Influenza A viruses are classified into subtypes based upon the antigenic properties of their Hemagglutinin (HA) and Neuraminidase (NA) surface glycoproteins. Hemagglutinin is responsible for binding to sialic acid at the termini of glycans acting as receptors on the host cell plasma membrane. Neuraminidase is involved in the final step of the replication cycle and helps in the release of mature virus. The RNA dependent RNA polymerase of Influenza virus lacks proofreading activity, which in turn mutates the genome, thereby causing various endemics and pandemics worldwide [1]. Humans were thought to be the natural hosts of influenza B and C but later also identified in other hosts too. Only influenza A has been the sole devastating agent from the beginning and has proved its novelty through various rapid shifts and drifts, making it more virulent and adaptable for new species lacking any pre-existing immunity against it [2]. The human population is under the risk of influenza pandemic every year due to high mutation rate of the virus.

A point mutation in one of these gene (HA and NA) changes the influenza A subtype and brought the upcoming pandemic. There are about 18 HA subtypes (H1-H18) and 11 NA subtypes (N1-N11); H16 was discovered in 2004 from black-headed gulls from Norway and Sweden, H17 was found in fruit bats in 2012 and the most recent H18 was found in a flat-faced fruit bat (*Artibeus planirostris*) from Peru [3-5]. The most common subtypes of Influenza A circulating in human population are H1N1, H3N2, H5N1. The H1N1 influenza A has been circulating in human population for more than last nine decades, first manifested in pandemic of 1917-18. Since its first pandemic reported in 1918, H1N1 has under gone a number of significant mutations including 1400 point mutations (around 10% of the viral genome) of which an approximate of 330 non synonymous changes (7.4% of codons) have been observed [6]. In 2009, swine H1N1 jumped to human population, affected several lives and caused pandemic around the globe.

Background

In last century, world experienced three pandemics; the “Spanish Flu” caused by H1N1 in year 1918-20; the “Asian Flu” caused by H2N2 in 1957-58 and “Hong Kong Flu” caused by H3N2 in 1968-69. The Spanish Flu Influenza H1N1 pandemic in 1918-19 caused more than 50 million deaths worldwide, the most deadly pandemic in human history [7]. The disease spread in three successive waves during 1918-19 pandemic including the first spring wave in March 1918 and the spread in US, Europe and Asia unevenly; the second fall wave spread globally from September to November 1918 which was highly fatal and the third wave occurred in early 1919 [8]. For 1918 pandemic, there was no links of human influenza to avian and swine influenza but clinical and epidemiological similarities linked it with influenza pandemics of 1847, 1889 etc. which was even unclear

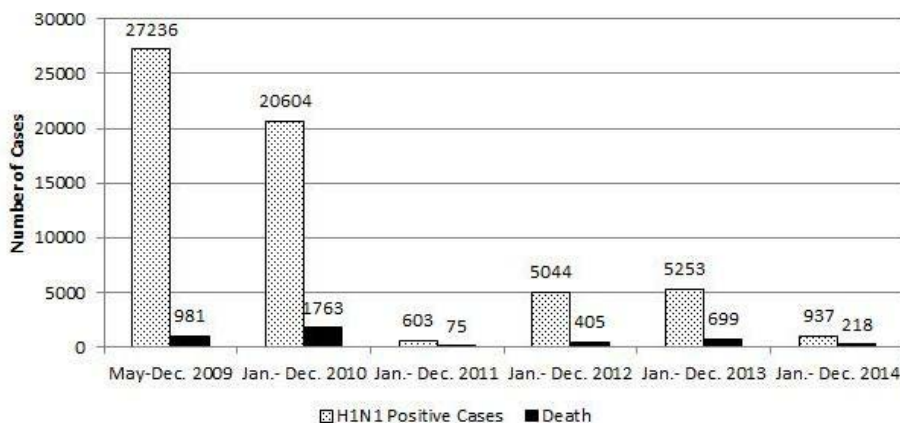


Figure 1: Bar diagram showing swine (H1N1) positive cases and death cases from 2009-2014 in India.

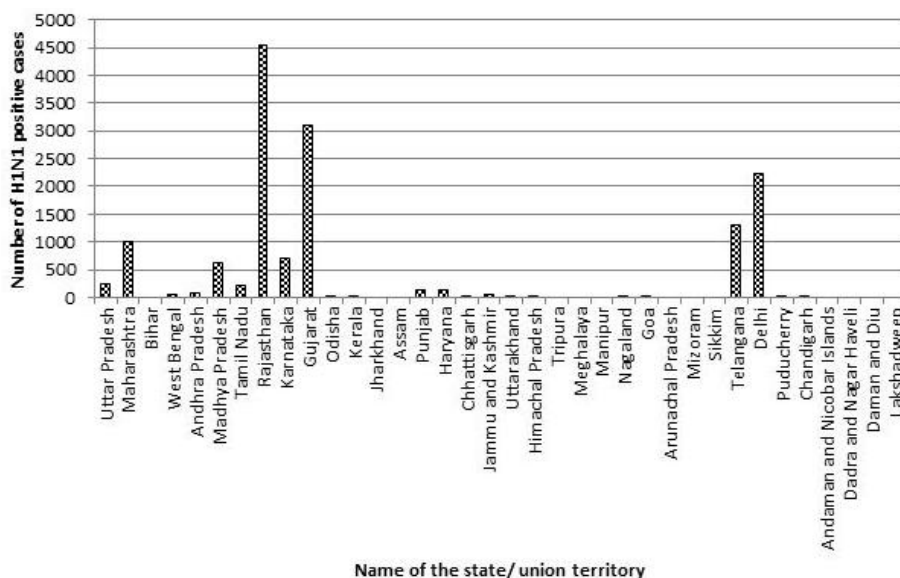


Figure 2: Bar diagram showing swine (H1N1) positive cases India (01 January to 22 February, 2015).

till 1930s [9]. Still the exact origin of the Influenza A pandemic is unknown, it has been said in early 1990s that at the time of Spanish Flu, influenza virus crossed the species barrier from pigs to human [10]. Even the phylogenetic analysis of all eight RNA gene segments of Influenza A showed that 1918 pandemic virus originated from H1N1 swine virus which itself might have originated from an H1N1 virus of avian origin which was reassorted over time by roaming in different host species. Despite the first reported respiratory infection by subtype A of H1N1 in 1976 from Fort Dix, New Jersey, the exact cause of the outbreak is still unknown. The re-emergence of H1N1 had been observed in China in May 1977 and after that in Russia [11]. In June 2009, WHO (World Health Organization) declared a pandemic of influenza A (H1N1) with the first reports of infection in the US in April 2009 with its subsequent spread from person to person all over the globe. Influenza A (H1N1) also called as “swine flu” because of similarity of most of genes with Influenza viruses normally found in pigs (swine) in North America. But according to the studies of H1N1 in 2009 by “Centre of Disease Control and Prevention” a different form of strain of North American pigs was found, which contained

two genes from pig circulating strain in Europe and Asia and bird (avian) genes & human genes and called it a “quadruple reassortant” virus. Influenza H1N1 was declared a seasonal strain on 10 August 2010 by Emergency Committee of World Health Organization (WHO), International Health Regulations (IHR). Influenza A, H1N1 is still circulating in human population worldwide [12,13].

India and flu transmission in dense population

India is the seventh largest country in the world and third largest country in Asia with huge population. It has 29 states including one NCR (National Capital Region) and seven union territories. According to population census 2015, India with 1.27 billion people is the second most populated country followed by China [14]. Any contagious disease like influenza spreads very quickly in different densely populated areas as huge population travel between cities everyday itself became a vehicle for viral transmission. Disease can transmit overseas as India has number of International airports to travel across the country for numerous purposes. Flu spreads mainly by nasopharyngeal droplets shed by infected persons during

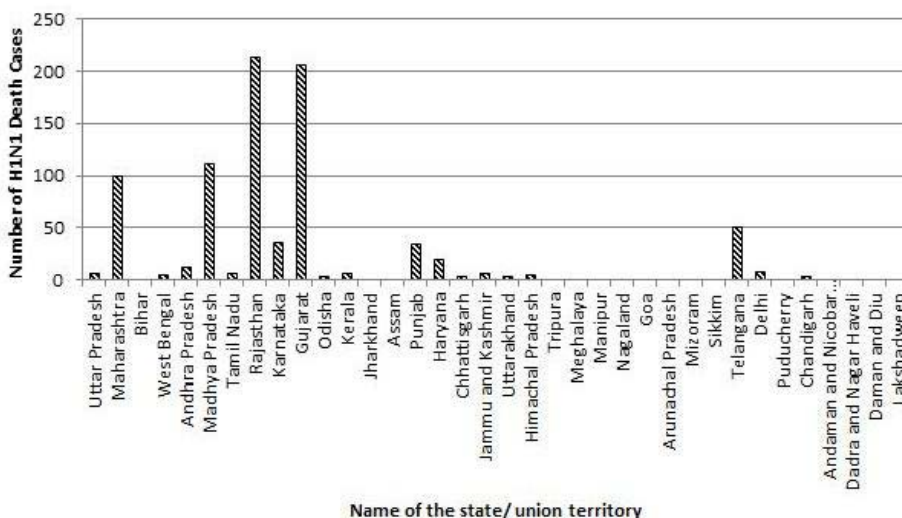


Figure 3: Bar diagram showing swine (H1N1) death cases in India (01 January to 22 February, 2015).

coughing, sneezing or talking. Symptoms of influenza include fever, cough, nasal discharge, body ache, head ache etc. and sometimes vomiting and diarrhea. Although anybody can catch infection but during emergency situations children, elders, pregnant women, health care workers and individuals with other chronic health complications are categorized under high risk group and recommended for flu vaccination yearly [15].

Influenza swine flu H1N1 visits in India after 2009 pandemic

After an outbreak of influenza A (H1N1) in U.S and Mexico, Indian Government started screening the visitors travelling from various affected countries. WHO declared a public health emergency on 25 April 2009 and looking at the global scenario, a series of preventive actions were taken by Indian Government. Integrated Surveillance units started scrutiny of visitors travelling across the countries at international airports (Mumbai, Delhi, Kolkata, Chennai, Bangalore, Hyderabad etc.) [16]. The first case of swine flu H1N1 was found positive on 13 May 2009, travelling from US to India (Hyderabad). Later other cases were found positive in other big cities of India (Delhi, Mumbai, Pune, Chennai, Bangalore etc.), which were showing ILI (Influenza Like Illness) symptoms suspected to be in close contact with the infected patients or as evidence cause from travel history [17]. WHO had declared the swine flu H1N1 pandemic on 11 June 2009 [18]. A high proportion of symptomatic cases were detected in India till August 2009. By 15 October 2009 around 12,486 confirmed cases of swine H1N1 were reported with 409 deaths [19]. Influenza activity peaked in October 2009 with high hospitalization and mortality. According to Indian official record on 21 October 2009, 427 people died and positive confirmed cases reached to 13,030 with maximum cases reported in Maharashtra [20]. After the deadly pandemic of 2009, virus was also found to be circulating post pandemic phases in different parts of the world. World Health Organization (WHO) announced the post pandemic period in the mid of August, 2010 and according to Ministry of health and Family Welfare Government of India, the virus was found circulating almost every year after 2009 with severe infection and mortality (Figure 1). Looking at the data from 2009-2015, number of swine H1N1 positive cases and deaths were highest in 2009 and 2010 respectively [21].

Influenza outbreak of 2015 in India and preventive measures by government

Although swine flu cases were detected at the end of 2014 and the new cases continued with 2015 beginning. On 02 January 2015, total 03 positive cases were detected and number reached 22 on 07 January with first death case of a 42 years old woman in Delhi [22,23]. According to Ministry of Health and Family Welfare on 22 February 2015, total 14,673 positive swine flu cases were detected across the country with death cases reached 841. Rajasthan and Gujarat state presented the maximum number of positive swine flu cases of 4,549 and 3,107 and death cases of 214 and 2,017 respectively (Figures 2 & 3) [21]. Number of new swine flu positive cases is still coming everyday across the country and on 09 March, 2015 the positive cases reached more than 26,000 with death cases of around 1,500 [24]. Again within next one week on 16 March, 2015 the positive cases reached around 30,000 with death cases recorded more than 1,700. In Rajasthan 378 people died because of swine flu and in western of Gujarat about 387 died with 6,100 positive cases [25]. Later on 05 April 2015 the affected cases of swine flu reached around 34,636 with death claimed cases 2123 [26]. If we look at the data of previous years (2009-2015), swine flu positive cases and death cases are maximum in year 2015 within just beginning three months (January-March) followed by year 2010 at position second [21,26]. Indian Government is closely monitoring the situation across the country and taking the required steps to control the situation. Ministry of Health has started the public awareness program by visual and print media as well as provided the required drugs (oseltamivir) to the affected states [27]. Diagnostic kits of H1N1 were ordered in stock for diagnostic purpose where as additional stocks of oseltamivir and N95 masks were also procured. Health care workers of health institutions providing Influenza AH1N1 treatment were advised for vaccination against H1N1 [28]. After monitoring the current situations of swine flu in the India, CDSCO (Central Drug Standard Control Organization) has started monitoring different centers in the country for the availability of diagnostic kits, vaccines and drug. Drug controllers of the states were also activated to provide necessary help in the affected areas. Only the dealers holding license under schedule X to the Drugs and Cosmetic

Rules have authorization to sell oseltamavir (Tamiflu) [29]. Tamiflu is most common prescribed medicine for influenza for individuals from the age of 2 weeks to older representing flu symptoms for more than 2 days. Tamiflu should be taken after confirmation of the disease by doctor's prescription and one who faces allergic reaction should stop the Tamiflu consumption. After observing the situation in the country, Ministry of health and Family Welfare have set certain guidelines for categorizing the symptomatic patients in category-A, B and C depending on symptoms, severity and health condition of the patient. Category-A includes patients with mild symptoms such as cough, fever and sore throat. Patients showing symptoms of category-A along with severe sore throat and high grade fever as well as people of high risk group showing symptoms of category-A are categorized in category-B. Category-C includes people with symptoms of category-A and B with severe health complications. Only patients under category-B is recommended for oseltamavir where as category-C is recommended for immediate hospitalization and treatment [30]. Under the influenza swine flu guidelines, Ministry of Health has also provided a list of 21 major laboratories, 12 under IDSP (Integrated Disease Surveillance Programme) and 9 under ICMR (Indian Council of Medical Research) that provide influenza swine flu testing facilities across the country [31].

Conclusion

The current review focuses on the re-emergence of H1N1 virus that has caused morbidity, mortality and socio-economic loss to the world during its pandemic phases. Again the same virus has alarmed in India from January 2015 by infecting thousands of people with severe mortality. Though the country prepared in terms of diagnostic and preventive measures but there is no such data available which can narrate the current scenario of influenza immunization in the high risk group or in general population. Although the control measures for flu seems to be very unyielding as it is airborne and able to transmit easily and rapidly in Indian scenario. As the influenza virus is very prone to genetic shift and drift, its mutation, transmission and spread is impossible to control but taking proper preventive measure can reduce the disease severity and economic burden. Annual influenza vaccination to all would be a good preventive measure but if not possible at least high risk group (children, health care workers, elders, immune-compromised etc.) should receive it. Designing viral conserved region based vaccines would be more helpful to protect against all influenza strains as well as against novel pandemic strains.

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