

History of Influenza: Pandemics in Iran and the World

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Influenza type A virus is well known for its capability of genetic changes either through antigen drift or antigen shift. Antigen shift is derived from reassortment of gene segments between viruses, and may result in an antigenically novel virus capable of causing a worldwide pandemic (1). Pandemic influenza was recorded in 1830 - 33, 1898 - 1900, four times in the 20th century (2) and once in the 21st century (3). The current paper aimed to discuss the time of influenza pandemics occurrence in Iran (2).

- Pandemic influenza, 1833: The first established evidence of influenza in Iran is back to the summer of 1833, when it happened with great virulence in Tehran. It is said that this pandemic arrived via trade routes from Syria and Constantinople, which was a part of a larger global pandemic and had involved thousands of people in Asia and Europe. Every day, among the capital's citizenry, dozens of people died, and the corpses were found in the corner of streets (4).

Dr. Cyril Elgood wrote in his book about this event as follows: "During the summer of 1833, a strange epidemic, possibly influenza, broke out in Tehran. It even pierced the boasted immunity of the staff of the mission. Even Fath-Ali Shah was attacked. His doctors reported that he had a severe fever and ague. The state of the city was even worse than that of the villages of Shimran. The deaths ran into many dozens a day (5)".

- Pandemic influenza, 1918 (Spanish flu): Illness from the 1918 flu pandemic, also known as the Spanish flu, came on quickly. It was due to A (H1N1) influenza virus. Some people felt fine in the morning but died by nightfall. People who caught the Spanish flu but did not die from it often died from complications caused by the bacteria such as pneumonia. During the 1918 pandemic, approximately 20% - 40% of the worldwide population became ill, an estimated 50 million people died, unlike earlier pandemics and seasonal flu outbreaks, the 1918 pandemic flu had high mortality rates among healthy adults. In fact, the illness

and mortality rates were highest among adults 20 - 50 years old (6).

It was one of the most dramatic events of medical history; statements include the greatest medical holocaust in history, the pandemic ranks with the plague of Justinian and the Black Death as one of the three most destructive human epidemics and deaths in the hospitals exceeded 25% per night during the peak. The pandemic is extensively chronicled. The impact on North America, India, Africa, Australia and Europe is detailed (2). Iran was one of the regions hit hardest by the pandemic, with mortality rates significantly higher than those of the most regions of the world. Though globally the victims of influenza lived primarily in urban areas, it was Iran's rural regions that faced the most casualties (7). The influenza epidemic entered Iran via the Western border from Baghdad to Kermanshah and finally reached Tehran. Ashair tribes, particularly the healthy males, died from influenza. The reported mortality rate in the nomadic Ghashghai tribe was as high as 30%. At that time, the city of Shiraz had a population of 50,000 of which 5,000 died from the Spanish flu. The mortality rate in Kermanshah was reported as 1%, but in the villages it was reported that 20% of the people died. In Tehran, during a three-month period, 1% of the population died as a result of the Spanish flu (8).

- Pandemic influenza, 1957 (Asian flu): In 1957, Influenza A (H1N1) abruptly disappeared and was replaced by a new reassortant virus that combined genes from the H1N1 strain and an avian virus. This new influenza A (H2N2) strain contained three new segments from the avian source and maintained the other five segments from the H1N1 strain of 1918 lineage (9). Therefore, in February 1957, a new flu virus was identified in the Far East. Immunity to this strain was rare in people younger than 65. Infection rates peaked among school children, young adults and pregnant females in October 1957. By December 1957, the worst seemed to be over. The elderly had the highest

rates of death (6).

Also one of the A virus subtypes, named as influenza A virus (A/Iran/1/1957 (H2N2)) was recorded in global biodiversity information facility (GBIF) and was modified on Jan 16, 2016 (10), but there is no data about the 1957 pandemic of this virus in Iran. In 1997, 18 human cases of avian influenza A (H5N1) infection occurred in Hong Kong. But it was not a real pandemic, because of stopping to the third stage of pandemic stages (3). In the first decade of the 21st century there was a mild to moderate pandemic, caused by A (H1N1) pdm09 virus. It was the last pandemic of influenza as just to hear (3).

- Pandemic influenza, 2009, Influenza A (H1N1) pdm09: In April 2009, near the end of the usual influenza season in the Northern Hemisphere, the first two cases of swine-origin influenza A virus (S-OIV) were identified in the United States. The centers for disease control and prevention (CDC) confirmed that these cases were caused by a genetically similar swine virus not previously identified in the United States. Genetic analysis of the strains showed that they were derived from a new reassortment of six gene segments from the known triple reassortant swine virus, and two gene segments (NA and matrix protein) from the Eurasian influenza A (H1N1) swine virus lineage (9). The influenza epidemic entered Iran mainly from Saudi Arabia by pilgrims (Omrah) and travelers from the other countries (3). Since the declaration of a swine flu pandemic by the world health organization (WHO), the Islamic Republic of Iran launched a surveillance system to test all suspected cases, both in community and hospital settings. From June 1st to 11th November 2009, there were 2662 real-time reverse transcription polymerase chain reaction (RT-PCR) confirmed cases of pandemic influenza A (H1N1) detected in Iran. Of these cases, 75% were 5 - 40 years old. During this period, 58 patients (2.18%) died. Geographic dis-

tribution of the reported cases showed the highest rates in Central and Eastern provinces of Iran (11). However, another wave of illness came in the winter of 2015 which was more extensive than the first one in 2009. It was an example of the potential "second wave" of infections that can happen during a pandemic geographic distribution of the reported cases that showed the highest rates and mortality in Southern and South-Eastern provinces of Iran.

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