An Outbreak of Influenza A Virus in a Hilltribe Village of Mae Hong Son Province Thailand, 1997

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Abstract

An outbreak of Influenza A virus occurred in a hilltribe village between July 18th and August 8th, 1997. The overall infection rate was 92.5 per cent. The household infection rate was higher in the crowded part of the village. The symptoms analyzed after all, were fever (100%), cough (99%), headache, myalgia (78.1%) and rhinorrhea (50.5%). The patients were self - recovery within 5-7 days. Isolation and Haemagglutination inhibition test (HI) were undertaken to identify the causative agent. The results were positive for influenza A/Wuhan/359/95(H_3N_2) - like strain. The outbreak did not spread to the town, possibly because of the differences in environmental condition. Predisposing factors of the village that may have influenced the outbreak were crowded living quarters, cold (8 - 10°C) and moist weather, poor personal hygiene and improper sanitation.

Key word : Outbreak, Influenza, North Thailand

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In a worldwide situation, influenza is one of the diseases with high potential for epidemic and pandemic. Over the past 100 years, pandemics occurred in 1889, 1918, 1957 and 1968. Its wide-spread and serious complications, notably viral and bacterial pneumonia result in high mortality and economic loss. In the USA, more than 10,000 excess deaths were reported during each of 7 of the 11

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influenza seasons between 1977 and 1988[1]. In temperate zones, epidemics tend to occur in the rainy season.

In Thailand, only 45,272 cases were reported with 3 deaths in 1996. The overall infection rate was 75.31/100,000 population and case fatality was 0.01 per cent[2]. In the first six months of 1997, the influenza strain in Thailand was usually similar to the worldwide strain. Cases occurred in sporadic pattern with the peak between July and October but no outbreak has been detected since 1980.

In July 1997, an influenza outbreak was reported from a hilltribe village in Pai District, Mae Hong Son Province. The province is in the mountainous area, in the northern part of Thailand. The outbreak was suspected to have already affected the whole village with potential spread to the town. The investigation was performed in order to study the etiologic agent, epidemiological pattern and possible risk factors.

MATERIAL AND METHOD

Data collection

At first, in order to confirm the outbreak, the team reviewed the medical records and case investigation forms of acute respiratory infected villagers, which was either collected from the hospital outpatient unit or the mobile service operated at the village on August 2nd,1997. On August 7th, the team performed an active case finding in the whole village. All villagers were interviewed by questionaires concerning general demographic data, history of present illness and general hygiene. Environment was surveyed to identify the risk conditions of the village such as water usage and housing. Furthermore, the number of Acute Respiratory Tract Infection (ARI) cases treated at the Pai Hospital during the outbreak period was reviewed in order to search for disease spreading to adjacent areas.

Case definition of ARI patient

Any villager of the hilltribe village who had at least three of the following symptoms fever, cough, nausea/vomiting, headache, snuffy nose/rhinorrhea and myalgia was recorded as a case. The symptoms must have occurred between July18th and August 8th, 1997.

Laboratory Techniques

Specimens from nasal swab, throat swab and paired serum were collected for viral study from the patients who had symptoms of ARI for less than 5 days or who had active symptoms. Swabs were placed in 3 per cent beef broth medium at 4°C and transported by airplane to the National Institute of Health. Upon arrival, specimens were spun at 3,000 rpm at 4°C for 30 minutes. Supernatant was then inoculated into fertilized hen's eggs and Madin Darby Canine Kidney (MDCK) cells. Specimens were tested for influenza A, influenza B, parainfluenzae type 1, 2, 3, respiratory syncytial virus and adenovirus by Haemagglutination inhibition test, using a WHO influenza reagent kit. Paired sera of 14 days apart were tested for confirmation of the viral four fold rising antibody. Another set of specimens from a nasal swab and a throat swab was collected for bacteria culture especially *H. Influenza* and *S. Pneumoniae*.

RESULTS

One hundred and thirteen of the 124 people in the hilltribe village were interviewed. Forty six were male. One hundred and five were cases and eight were healthy. There were no differences in the infection rate of this illness by age but there were differences in location. The household infection rates from the central area of the village were 83 - 100 per cent, while those from the outskirts (which were less crowded) were 62.5 - 71.4 per cent. The average infection rate was 92.5 per cent (105/113) while the infection rate in the people over 60 years and less than 5 years was 100 per cent (4/4 and 20/20 respectively).

The first patient was a student of a high school in Pai District, who had the symptoms of fever, cough and headache on July 18th, 1997. After the onset of illness, the patient came back home with his four friends that afternoon. The following morning, one of his friends had the symptoms and on August 22nd, 1997 both families had developed the illness. After that, two or three cases occurred everyday and the peak of the cases was about 10 days after the beginning of this outbreak (Fig. 1).

The symptoms of the patients were fever (100%), cough (99%), headache (78.1%), myalgia (78.1%), rhinorrhea (50.5%), nausea or vomiting (12.5%) and diarrhea (5.7%) (Fig. 2). From the data of 53 cases who had recovered, the illness lasted between 5 and 7 days. During convalescence, a dry cough prolonged for another week. The spreading of the disease began in children who stayed either at school or at home and it spread to their parents.

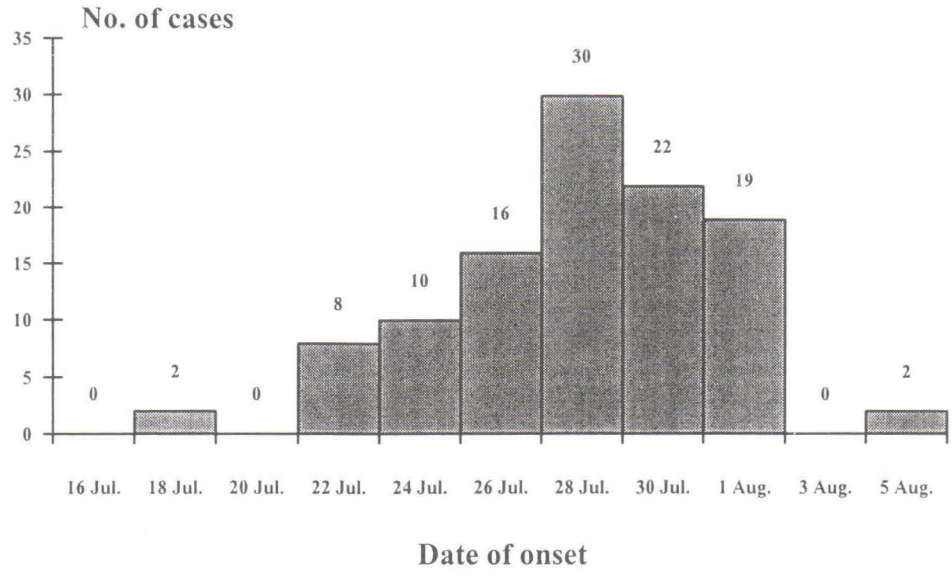

Fig. 1. Number of ARI cases at the hilltribe village, by date of onset, Pai District July 18th - August 8th, 1997.

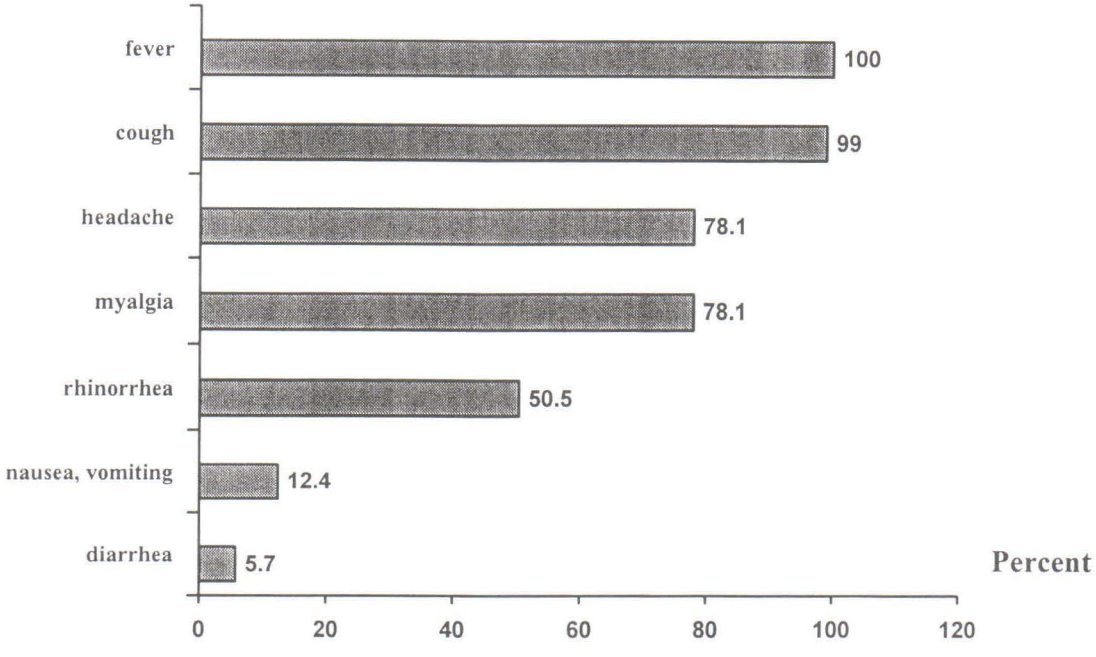

Fig. 2. Symptoms of ARI cases at the hilltribe village, Pai District July 18th - August 8th, 1997.

The medical doctors who examined the patients on August 2nd,1997 diagnosed the patients as having upper respiratory tract infection (URI) in 80 per cent and 3.8 per cent had URI symptoms with bacterial infection superimposed. Viral pneumonia was diagnosed in 6.6 per cent and bacterial pneumonia in 1.9 per cent. Two of the villagers, one of whom was elderly and the other eight months old needed hospitalization. The others were treated as ambulatory and were given primary heath care advice by the medical personnel. Results of chest X-rays and complete blood counts of seven pneumonia cases supported viral etiology.

Two of the staff who were in the mobile service on August 2nd became ill on the 6th and 8th of August, 1997 respectively. Their symptoms were similar to that of the hilltribe people. Their throat swab specimens were positive for influenza A/ Wuhan/359/95(H_3N_2) - like strain and both of them had four fold rising antibody to the same strain of influenza A. There was no spread of the disease to other personnel in Pai Hospital. From the hospital records reviewed and school nurses interviewed, no increase of the number of ARI cases was found in the adjacent areas of the village or the first patient's school.

The results of cell culture isolation and egg inoculation from the nasal and throat swab specimens of the villagers were positive for influenza A/ Wuhan/359/95(H_3N_2) - like strain (11 cases from 22 cases). Of those 11 positive cases, 3 cases were culture positive for *H. influenzae*. Fourteen paired sera specimens were collected, and a four fold rising antibody for influenza A/Wuhan/359/95(H_3N_2) - like strain were positive in 9 cases.

The village was 60 kilometers from the nearest town and 3 kilometers from the Public Health Service. The road from the village to the town was rugged and dirty and it took 3 - 4 hours of travel. The community was based in a valley. The weather was cold (8 - 10°C) and moist, and sunshine could not reach the area. From the environmental survey, the community consisted of 18 houses, 5 toilets, 2 rice mills and one primary school. The village consisted of one-storey houses, none more than 5 meters apart. The average width was 8.8 meters (4 -18 meters) and the average length was 11 meters (4 -24 meters). Out of 18 houses, nine houses were studied, six houses had no windows and the others had only one. Inside the houses, there were no partitions and the inside kitchens had no exhaust for smoke. They also had no proper sanitation, poor ventilation and poor lighting. In some houses, there were no toilets and occupants shared them with their neighbors. Occupants slept under mosquito nets with 3 - 4 persons in each net. Most houses were close together in the central area of the village which was in a valley. Each house was very crowded averaging eight persons. The most crowded house encountered consisted of 30 persons (more than 1 person per 3 m^2). The villagers went to town occasionally to sell food and to attend school.

DISCUSSION

The incubation period of this illness could be estimated by the duration from the first and the second case which was between 48 - 72 hours. It suggested infectious diseases more than other diseases because all cases had fever. Moreover, the symptoms of cough, rhinorrhea and myalgia made viral infection more likely. The data of self remission in nearly all patients without specific treatment almost ruled out bacterial infection such as Mycoplasma infection or Meningococcemia[3]. The time of the occurrence was during the epidemic season of influenza A in Thailand, between July and October. To differentiate from other viruses, influenza B occurs throughout the year and normally does not cause an epidemic. Parainfluenza occurs between January and July with the peak in March, while respiratory syncytial virus occurs between August and December and adenovirus occurs sporadically without seasonal preference[4]. The laboratory results confirmed the causative agent as influenza A/Wuhan/359/95(H_3N_2) - like strain by both isolation technique and immunology technique.

The outbreak was confined only among the inhabitants of the hilltribe village. The environmental factors in the hilltribe village that may facilitate the spread were crowded living quarters, cold (8 - 10°C) and moist weather which made the organism survive longer. This may account for the failure of the disease to spread to the town where the community was less crowded and warmer. The high infection rate in this outbreak may also have been caused by low immunity, poor personal hygiene and improper sanitation. For intervention, health education was introduced in the village. Surveillance

was undertaken in the adjacent areas and the central area of the town but no evidence of increase of influenza - like cases was detected.

Influenza surveillance has been carried out in Thailand since 1972 and so far 20 strains of influenza have been isolated in the Bangkok area[5]. In 1997, the National Institute of Health reported that the prevalent strain in Bangkok was influenza A/Wuhan/359/95(H_3N_2) - like strain. However, the strain of causation viruses in other parts of Thailand is mostly unknown because of the limited number of specimens sent to the center. Geographical differences also occur with the Southern region reporting the number of cases 2 to 3 times higher than the other regions. We do not know which strains circulate beyond Bangkok especially in the North which is in proximity to Southern China. China is presumed to be the origin of viral antigenic mutation[6]. However, the strain of influenza A virus in Northern region was the same strain as in central region from this outbreak.

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