INFLUENZA SURVEILLANCE IN SOUTHERN THAILAND DURING 2009-2010

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Abstract. The aim of this study was to determine the epidemiology of influenza infection among patients with influenza-like illness by real-time RT-PCR in southern Thailand from August 2009 to January 2011. The predominant strain in Thung Song District was influenza A. Sporadic cases of influenza occured year round but the incidence peaked from August to November 2009 and July to November 2010. During August to November 2009, pandemic H1N1 (pH1N1) activity was observed along with a low level of seasonal influenza co-circulation. Subsequently, seasonal influenza (H3) activity increased and became the predominant influenza strain, with co-circulation with pH1N1 and influenza B during the 2010 influenza season. Continual surveillance of influenza activity is useful for public health planning in southern Thailand and plays a major role in future influenza control and prevention measures.

Keywords: Influenza, surveillance, real time RT-PCR

INTRODUCTION

Influenza virus infection is a yearly global health problem. Several influenza pandemics have been reported, such as the Spanish influenza outbreak responsible for high mortality on a global scale (Reference? Year of outbreak?). An outbreak of human pandemic influenza (pH1N1) occurred in North America in April 2009 and subsequently spread throughout the world. In June 2009, the World Health Organization (WHO) declared this new virus a pandemic strain which became an international public health problem. In August 2010, the WHO declared the pH1N1 infection to be in a post-pandemic stage with viral activity resembling seasonal influenza with continuous circulation in the human population as a seasonal strain (WHO, 2010). pH1N1 infection rate was higher among children, unlike seasonal influenza, with higher rate among adults aged ≥ 60 years (Chieochansin *et al*, 2009). Most pH1N1 clinical characteristics were similar to typical seasonal influenza, such as cough, sore throat, fever and nasal congestion. Unless the patient had any underlying medical condition, the symptoms were not usually severe.

The pH1N1 virus was detected in Mexico in April 2009 and rapidly spread

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throughout the world. In Thailand, the first case was confirmed in a traveler from Mexico in May 2009, as reported by the Bureau of Emerging Infectious Diseases, Department of Disease Control, Ministry of Public Health (Department of Disease Control, 2009). Spread was facilitated by population density in certain areas, such as schools in Bangkok, the largest metropolitan area and capital city of Thailand. From this epicenter the virus spread to other regions of the country. In southern Thailand, the outbreak was detected in Thung Song District, Nakhon Si Thammarat Province on June 28, 2009. Since then the disease has persisted and become seasonal influenza.

In this study, we investigated influenza virus activity in Thung Song District, Nakhon Si Thammarat Province, Thailand by performing real-time reverse transcription polymerase chain reaction (rRT-PCR) for influenza virus detection among samples obtained from randomly selected patients with influenza-like illness (ILI). We obtained samples thoughout the influenza season from 2009 to 2010 to monitor influenza activity and assist in prevention and control measures for influenza in Thailand.

Fig 1–Map of Thailand showing the location of Thung Song District, Nakhon Si Thammarat Province.

MATERIALS AND METHODS

Thung Song District is located in southwestern Nakhon Si Thammarat Province, southern Thailand (Fig 1). It was selected as the sentinel site for influenza surveillance representing southern Thailand. This district is 612 km south of Bangkok, on the Malay Peninsula. There are 2 seasons: rainy and summer (Reference?). The district has a population of 150,671 and is subdivided into 13 subdistricts (Reference?). Thung Song is an agricultural area (rubber plantation and palm oil). Most of the residents work in agriculture (Fig 1).

Sources of specimens and ethical approval

In total, 1,209 nasopharyngeal or throat swab samples were collected from approximately 15-20 patients weekly (10-15 out-patients and 5 in-patients) diagnosed with ILI, having fever, cough, sore throat, nasal congestion or rhinorrhea, from August 2009 to January 2011. We examined 519 males and 690 females ranging in age from 13 days to 90 years (mean age 35 years). The specimens were collected in viral transport medium containing penicillin G 2 x 10^6 U/l and streptomycin (200 mg/l) kept on ice and sent to the Center for Excellence in Clinical Virology within 48 hours of obtaining the specimen. The collected samples were screened for seasonal influenza A, influenza B and p H1N1.

The study was approved by the Ethics Committee of Thung Song Hospital, Nakhon Si Thammarat and the Faculty of Medicine, Chulalongkorn University. All the subjects or their parents were informed of the purpose of the surveillance and gave written informed consent prior to participation.

Detection of influenza viruses by real-time RT-PCR

RNA was extracted from each sample using a Viral Nucleic Acid Extraction Kit (RBC Bioscience, Taiwan) according to the manufacturer's protocol and subsequently transcribed into cDNA. The reaction mixtures for amplification, including the primers, specific TaqMan probes and thermal profiles have been described previously (Kendal *et al*, 1982; Suwannakarn *et al*, 2008; WHO, 2009). RT-PCR was performed using the SuperScript III Platinum One-Step RT-PCR system (Invitrogen, Foster City, CA) in a Rotor-Gene 3000 (Corbett Research, New South Wales, Australia).

RESULTS

During July 2009 - January 2011, there was sporadic influenza activity in Thung Song. Of 1,209 samples collected, 214 (18%) tested positive for influenza viruses with influenza A viruses being the most common subtype identified. Of the positive samples, 50% (108/214) were positive for pH1N1, 44% (95/214) were positive for seasonal influenza H3 and 5% (11/214) were positive for influenza B virus. The mean age of the positive cases was 37 years.

The first influenza peak occurred during August to November 2009, the majority being pH1N1. Additional cases were reported during January and March 2010 with seasonal influenza (H3) and pH1N1 circulating low levels during January and February, 2010. After a decrease in influenza circulation during April to June 2010, there was an increase in pH1N1 along with low levels of influenza B virus. During September to October 2010, influenza peaked again with most cases positive for seasonal influenza (H3), this peak started to decline in November 2010 (Fig 2).

DISCUSSION

Since the pH1N1 outbreak in Thailand in June 2009, there have been 3 waves of influenza activity dominated by pH1N1. The first pH1N1 peak was between August and October 2009 with sporadic cases of influenza infection occurring during December 2009 to June 2010. In July 2010, the influenza positive cases began to increase and by October 2010, influenza activity had started to decrease. This study shows the activity of influenza viruses from August 2009 to January 2011 with influenza A viruses predominating in the Thung Song area.

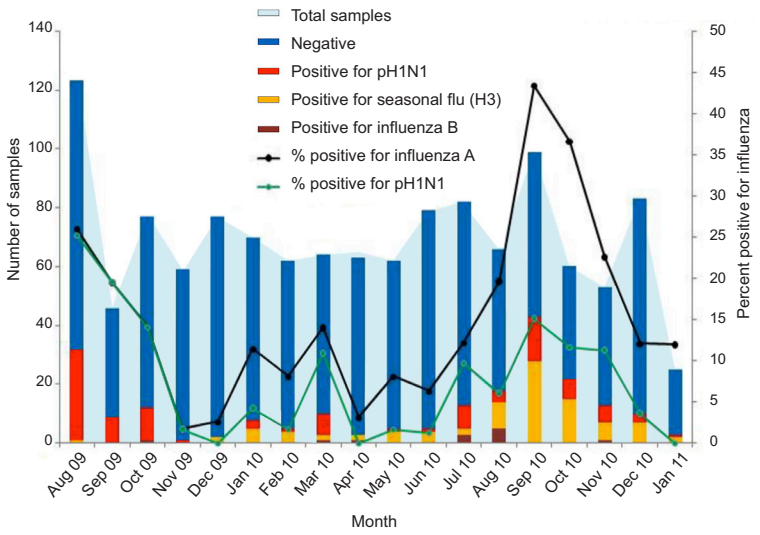

Fig 2–Number of influenza cases in Thung Song District, Nakhon Si Thammarat, Thailand.

The strain circulating during the outbreak in August to October 2009 was pH1N1 resulting in a large number of cases, since the majority of the population had no antibodies against pH1N1 since the virus was the result of a triple re-assortment among human, avian and swine influenza viruses (Trifonov *et al*, 2009).

The pH1N1 virus is still circulating in Thung Song District but at lower levels than during 2009 - 2010, most likely due to waxing immunity in the population.

Only a small number of influenza viruses were detected in Thung Song during November 2009 to June 2010, but the activity increased between July and December 2010, which is the rainy season in southern Thailand. The rainy season in this part of Thailand persists longer than in the rest of the country. Influenza activity has shown various season related patterns in different areas of Thailand. In Chum Phae District, northeastern Thailand, approximately 449 km Northeast of Bangkok, influenza activity has two distinct peaks, from December to February, during the cooler months, and from July to October, during the rainy season in this region (Prachayangprecha *et al*, 2010). In Sa Kaeo Province, eastern Thailand, influenza is at its highest activity from June to August (Simmerman *et al*, 2007).

Seasonal influenza activity is associated with many factors, such as weather that can affect the transmission of the virus (Lowen *et al*, 2007). The higher number of influenza positive samples might have been due to the weather. Cold, dry weather facilitates influenza virus transmission as it helps stabilize the particle and increases spreading distance (Linde *et al*, 2009). These factors are inadequate to explain the influenza activity pattern since transmission patterns differed by region (Soebiyanto *et al*, 2010). In this study, influenza activity increased between July and November, which is the rainy season in southern Thailand. This is considered unfavorable weather for influenza viruses. Other factors could be associated with influenza transmission, such as El Nino or seasonal fluctuations in host immune response or social behavior (Viboud *et al*, 2004; Truscott *et al*, 2009).

The activity of specific influenza viruses has been shown to vary by region. Seasonal influenza (H3) was predominant in the Thung Song area, pH1N1 was more common in Chum Phae District, Khon Kaen Province with a peak activity during July 2009 to September 2010; in October

2010 seasonal influenza (H3) and influenza B virus activity started to increase (Prachayangprecha *et al,* 2010).

This study investigated influenza activity in Thung Song area, focusing on influenza strains currently circulating.

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