

## Human Immunodeficiency Virus Screening in Taiwan, 2004-2008

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### Abstract

The three major routes of transmission of Human Immunodeficiency Virus (HIV) include blood, sexual encounter, and vertical maternal-fetal transmission. Taiwan reported the first case of HIV infection in 1984. Since then, a variety of active and passive screening strategies has been implemented. When hospitals and clinics identified new cases of HIV, they were immediately referred to appointed HIV hospitals for further diagnosis and treatment. In addition, surveillance among susceptible high risk population, and screening of new military recruits, inmates, blood donor, patients with sexually transmitted diseases, inpatient intravenous drug abusers, and pregnant women, and anonymous screening were also implemented. From 2004 to 2008, an average of 2,504,455 screenings were performed among people 18 to 64 years of age each year in Taiwan. The overall proportion of individuals screened in these age groups was 16.2%. The proportion of males and females screened were 20% and 12.3%, respectively. Despite the effort to collect primary and secondary data through various official government channels, this study still was not able to obtain complete screening data from

hospital physical examinations and non-government organizations that provided HIV screening service. As a result, the proportion of individuals screened among the population may be underestimated. We suggest that efforts should be made to improve the rate of screening. In addition to continuing the existing education, consultation and screening programs among susceptible risk population, mass HIV screening campaigns may be considered in order to raise the awareness of the risk of HIV and encourage the use of HIV screening among the population. These strategies should facilitate the early detection of HIV infection.

**Key words:** HIV, human immunodeficiency virus screening

### Introduction

#### Purpose of HIV screening

The three major routes of transmission of Human Immunodeficiency Virus (HIV)

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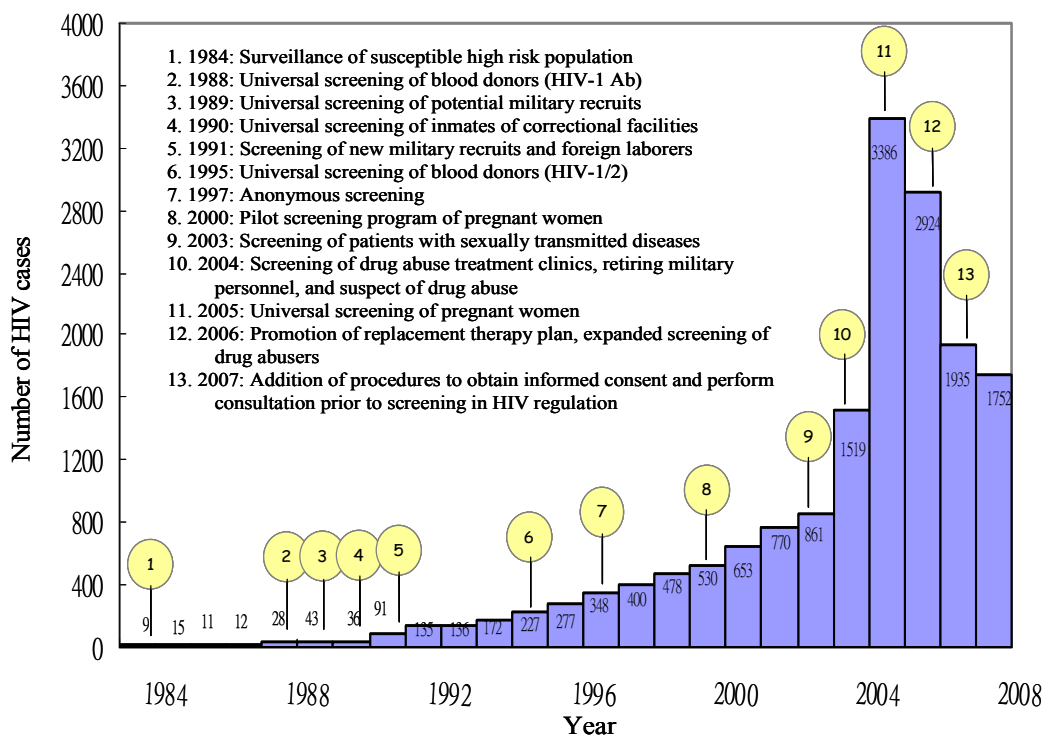
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include blood, sexual encounter, and vertical maternal-fetal transmission. According to the HIV Infection Control and Patient Rights Protection Act [1], when a case of acquired immunodeficiency syndrome (AIDS) or HIV infection is identified, health care personnel should immediately report to health authorities, which will then provide referral service for further treatment. The current definition of confirmed and reportable HIV infection is adopted from the World Health Organization (WHO) and Centers for Disease Control and Prevention of the United States. A confirmed case of HIV infection is defined by two positive screening tests such as enzyme-linked immunoassay or particle agglutination, and positive result from Western blot test [2].

Taiwan reported the first case of HIV infection in 1984. Since then, a variety of active and passive screening strategies has been implemented. When hospitals and clinics identified new cases of HIV, they were immediately referred to appointed HIV hospitals for further diagnosis and treatment.

Surveillance among susceptible risk population, and screening of new military recruits, inmates, blood donor, patients with sexually transmitted diseases, inpatient intravenous drug abusers, and pregnant women, and anonymous screening were implemented (Figure 1). In addition, routine periodic testing of laboratory diagnostics and continuing education programs were held in order to strengthen the monitoring and confirmation capabilities of HIV infection. Advanced laboratory diagnostic instruments and methods were also introduced from the developed world to improve the sensitivity and specificity of HIV and antibody detection and to establish a complete HIV screening network.

The strategies of infection control of HIV include early diagnosis combined with antiviral cocktail therapy to reduce the viral load of patients and the subsequent transmission of HIV to others. Alternatively, protective measures carried out by HIV-infected patients through education and consultation can also reduce the chance of HIV transmission. Clinically, optimal use of antiviral cocktail therapy can reduce the morbidity and mortality of HIV patients. In 2006, the United Nations General Assembly unanimously approved the motion to urge all member nations to start implementing national HIV screening, and to make HIV screening a national, regional and international activity. Currently, the United States, Zambia, Malawi, and Ethiopia are countries that have adopted national HIV screening. Whether Taiwan should implement national HIV screening is an issue that requires careful consideration.



**Figure 1. Important milestones of HIV screening policies in Taiwan**

### Current status of HIV infection in Taiwan

According to the affiliated laboratory and reporting mechanism, through September, 2009, the total number of reported indigenous HIV-infected individuals in Taiwan was 17,966 [3]. The gender of these infected cases was predominantly male. The number of male and female cases was 16,474 (91.7%) and 1,492 ([8.3%], respectively, with a male to female ratio of 11 to 1. The age of the majority of infected cases was between 20 and 39 years old. The number of patients aged 20 to 29 was 6,679 (37.2%), while the number of patients aged 30 to 39 was 6,423 (35.8%). The average age of infection was 33.7. It is worth noticing that although the total number of new HIV cases has decreased, the number of new cases of HIV infection between 15 and 24 years old has increased. Individuals in this age group should be the new focus of HIV prevention and control.

Because the susceptible high risk population often do not perceive themselves at a higher risk of HIV infection, combined with the worry of discrimination, invasion of privacy, deprivation of rights to work, inconvenience of access to medical care, high cost of medication and side effect among HIV-infected patients, seeking medical care may be delayed as a result. According to published studies from other countries, delayed diagnosis of HIV infection is very common. Twenty-four to 45 percent of HIV-infected individuals have reached the diagnostic criteria of AIDS when they were first diagnosed of HIV infection [4, 5]. Analysis of reportable HIV case data in Taiwan showed that ten percent of new HIV-infected cases were also reported as cases of AIDS, and 20% of new HIV-infected cases progressed into AIDS within one year of being reported, indicating that delayed diagnosis is

also very common in Taiwan.

Questions have been raised as to why the number of reported HIV-infected female cases was low. It is hypothesized that females were less likely to be screened, or the total number of HIV screening in females was low, which contributed to the low number of reported HIV-infected female cases. It is also thought that the Centers for Disease Control in Taiwan may have emphasized HIV screening in certain susceptible risk population, resulting in the higher positive rate of screening observed in these groups. The relatively high positive rate of screening among the susceptible high risk population may lead to biased negative general impression toward these groups, which may hinder the cooperative prevention and control efforts pursued between public health authorities and non-government organizations. There are also issues regarding whether the channel and targeted population of HIV screening need to be expanded in Taiwan. All of the above-mentioned questions should be carefully considered during the process of public health policy making. The purpose of this study is to understand the current status of HIV screening in Taiwan. Information obtained from this study should provide insights as to how to promote early HIV screening among individuals at a higher risk of HIV infection through various channels for future references in policy making.

## **Materials and Methods**

### **Study period and subjects**

The data used in this study were derived from the following sources: claims data from Bureau of National Health Insurance from 2004 to 2008, statistics of blood donors from

the blood donation stations of Taiwan Blood Service Foundation from 2004 to 2008, physical examination of potential military recruits from the Conscription Agency of the Ministry of the Interior from 2004 to 2008, physical examination of new military recruits from the Ministry of National Defense from 2004 to 2008, screening of susceptible high risk population from local health authorities, annual screening and new entrants of correctional facilities from the Ministry of Justice from 2004 to 2008, anonymous HIV screening by appointed hospitals contracted by the Centers for Disease Control, Taiwan from 2004 to 2008, pilot HIV screening project of retiring officers and soldiers serving compulsory military service from 2004 to 2005, mass HIV screening of expectant women from 2005 to 2008, participants of replacement therapy for drug abusers reported by institutions for drug abuse replacement therapy from 2006 to 2008.

### **Definition and data analysis**

The act of HIV screening is defined as follows: health care personnel provide pre-screening consultation and perform HIV screening to individuals who submit informed consent through various channels. The samples obtained from screening are tested twice by either enzyme-linked immunoassay or particle agglutination. Data analysis was performed using Microsoft Excel program. Descriptive statistics on the number of screening performed, the type of screening, and gender by year were generated in order to understand the status of HIV screening during this period.

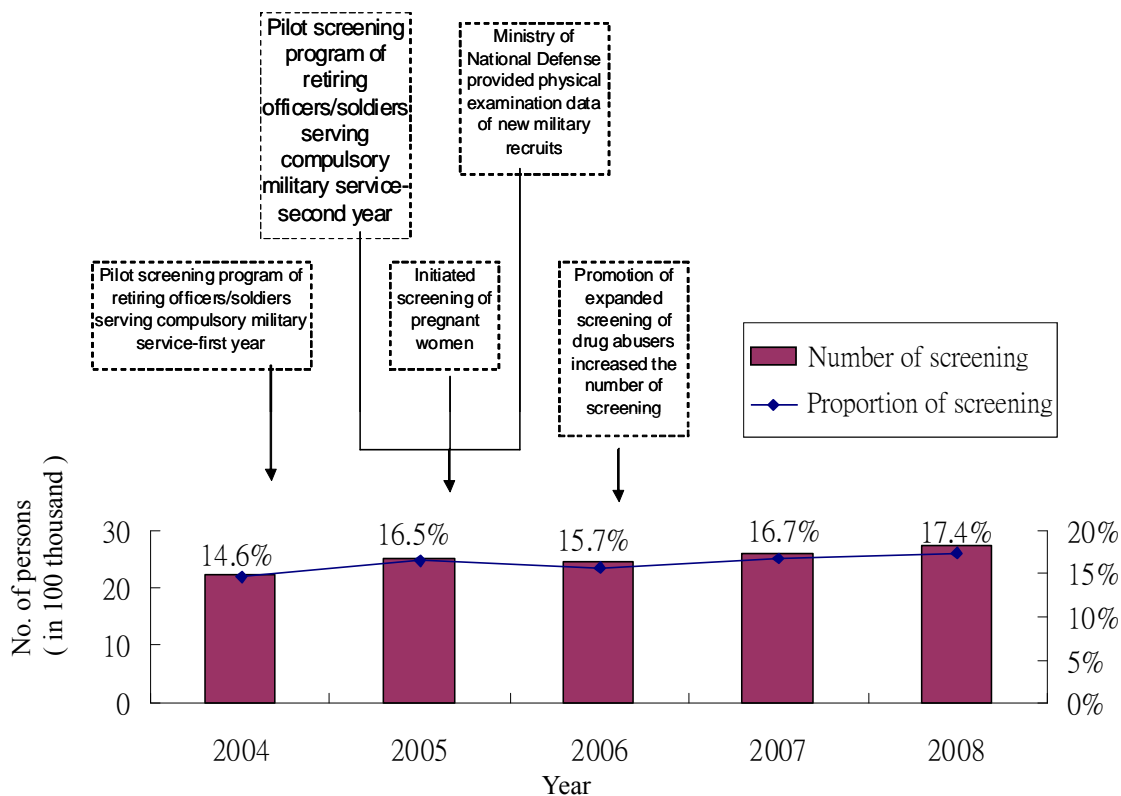
**Results**

Taiwan has implemented HIV screening strategies based on the recommendation of the WHO for many years. This study systematically collected HIV screening data from various sources, and categorized them by the type and target of screening in order to capture the whole picture of HIV screening in Taiwan. These 11 categories include tests performed by health care facilities, blood donation centers, screening of expectant women, anonymous screening, conscription-related physical examinations (including physical examinations of potential military recruits, physical examinations of new military recruits, and screening of retiring officers and soldiers serving compulsory military service), screening of inmates of correctional facilities, screening of sex

workers and their clients, screening of drug abusers, screening at sites frequented by men who have sex with men, physical examination, and other HIV screening campaigns held by public health agencies.

Between 2004 and 2008, the total number of HIV screening among individuals aged 18 to 64 years old was 12,522,275, with an average of 2,504,455 each year. The overall proportion of individuals screened was 16.2%. The proportion increased from 14.6% in 2004 to 17.4% in 2008. The rate of increase slowed after 2006, and the number of screening reached 2,738,083 in 2008 (Figure 2).

Further analysis of channels of screening demonstrated that the most popular channel of screening was through blood donation centers, followed by conscription-related physical examinations, which accounted for 10.9% of all



**Figure 2. Number and proportion of HIV screening, Taiwan, 2004-2008**

screening (Table). The average utilization of each screening channel and trend is as follows: health care facilities, 3.9%, flat trend; blood donation centers, 67.1%, decreasing trend; screening of expectant women, 8.2%; conscription-related physical examinations, 10.9%, slight decreasing trend; screening of inmates of correctional facilities, 2.9%; increasing trend; screening of drug abusers, 1.1%, flat to increasing trend; anonymous screening, 0.3%, increasing trend; screening of sex workers and their clients, 0.7%, flat to slight decreasing trend; screening and physical examination of men who had sex with men, 0.2%, flat to increasing trend; physical examinations, 2.4%, increasing trend.

Analysis of the number of HIV screening by gender showed that between 2004 and 2008, the total number of screening among males aged 18 to 64 years old was 7,792,043, while

the total number of screening among females was 4,730,232. The number of screening among males was 1.6 times that of females. The overall proportion of males screened was 20%, which increased gradually since 2006. The overall proportion of females screened was 12.3%, with the lowest proportion of 10.3% in 2004. Since the promotion of screening of expectant women started in 2005, the proportion increased to 13% (Figure 3).

### Discussion

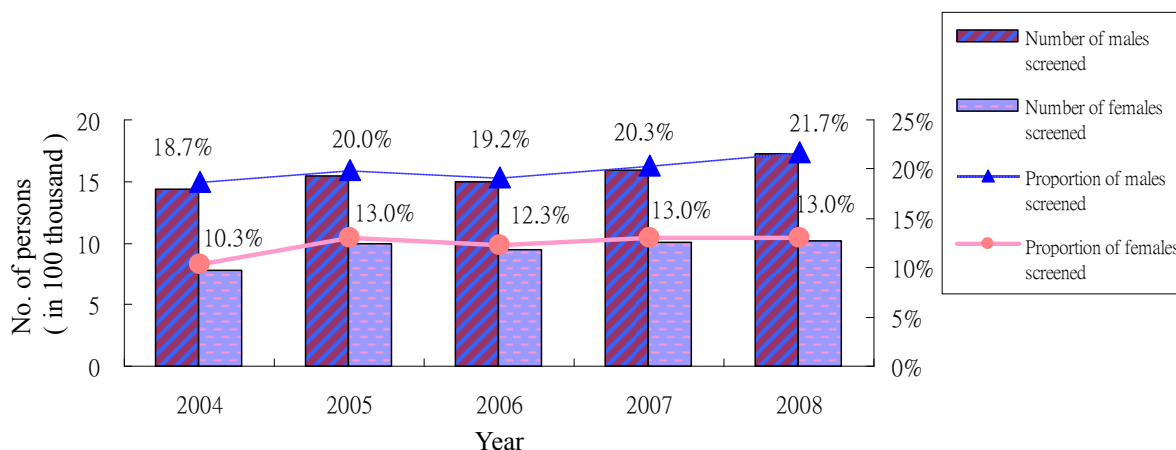
The early diagnosis of HIV infection is of both public and clinical importance and significance [4]. According to data obtained from this study regarding all available channels of HIV screening, it is estimated that the average proportion of screening in individuals aged 18 to 64 was 16.2% in the past five years. The is lower than the reported

Table. Percentage of HIV screening through different channels, Taiwan, 2004-2008

Channel	2004	2005	2006	2007	2008	Average (2005-2008)
Healthcare facilities	3.8%	3.6%	3.8%	4.0%	3.9%	3.8%
Blood donation centers	79.6%	67.1%	68.7%	68.1%	65.3%	67.3%
Screening of pregnant women	—	9.0%	8.4%	8.0%	7.4%	8.2%
Conscription-related physical examination	7.4%	11.4%	11.2%	10.6%	10.4%	10.9%
Screening of inmates of correctional facilities	2.4%	2.2%	2.7%	2.2%	4.5%	2.9%
Screening of drug abusers	0.2%	0.6%	0.6%	1.6%	1.6%	1.1%
Anonymous screening	0.2%	0.2%	0.2%	0.3%	0.4%	0.3%
Sex workers and their clients	0.9%	0.7%	0.7%	0.7%	0.6%	0.7%
Screening at sites frequented by men who have sex with men*	0.1%	0.1%	0.1%	0.1%	0.3%	0.2%
Physical examination	2.1%	1.8%	1.5%	2.3%	3.9%	2.4%
Other**	3.3%	3.1%	2.1%	2.2%	1.8%	2.3%

\*Sites frequented by men who have sex with men include pubs, saunas,...etc.

\*\*Screening performed during campaigns or events held by local health authorities



**Figure3. HIV screening by gender, Taiwan, 2004-2008**

27.7% in individuals aged 18 to 64 in the past 12 months in the United States in 2001 [6]. Through September, 2009, the total number of reported indigenous HIV-infected individuals in Taiwan was 17,966. Analysis of the number of HIV screening by age group showed that the number of reported HIV-infected individuals aged 15 to 49 was 16,430. Research indicated that the actual number of HIV-infected individuals aged 15 to 49 was estimated to be 2.4 times the number of reported cases [7]. It is estimated that in Taiwan, there were still 23,000 HIV-infected individuals that did not realize they were infected. As a result, it is necessary to increase the coverage of HIV screening in order to identify these hidden cases.

Analysis of the number of HIV screening by gender showed that in 2004, the number of screening among males was 1.8 times that of females. Since the promotion of mass screening of expectant women started in 2005, the ratio decreased to close to 1.6. When examining the number of reported cases, before 2005, the ratio of male to female cases was 9.6. Between 2005 and September, 2009, the ratio of male to female cases decreased to

8.9. The finding suggested that mass screening of expectant women may facilitate the identification of female cases infected with HIV. However, other factors may also contribute to the observed decrease that may warrant further investigation.

Because blood donors, conscription-related physical examinations, and screening of expectant women were the major channels of HIV screening in Taiwan, the age groups of individuals receiving HIV screening were primarily between 18 to 35 years old. The remaining screening was from anonymous or non-anonymous screening due to symptoms, and screening of susceptible risk population. As a result, mass HIV screening campaigns which include education, consultation and screening programs may be considered as a strategy to strengthen the concept of HIV prevention in the population. In addition, providing multiple channels of screening and convenient accessible screening sites, coupled with effective advertising campaigns, may raise the awareness of the risk of HIV and promote the early use of HIV screening among the population. Relevant public health authorities also need to increase the

cooperation with venues frequented by the susceptible high risk population and the involved non-government organizations to encourage the utilization of HIV screening service among the population in need.

The proportion of individuals 18 to 64 years old screened was 17.4% in 2008, an increase of 0.7% compared to 16.7% in 2007. In Taiwan, the amended HIV Infection Control and Patient Rights Protection Act was announced on July 11, 2007, which requires that medical care personnel should first obtain informed consent and give pre-screening consultation before collecting blood sample for HIV screening. In other countries, it is mandated that written consent needs to be obtained prior to HIV screening. This requirement resulted in decreased willingness in HIV screening and reduced the proportion of individuals screened in the population [7, 8]. Whether the new regulation may affect HIV screening in Taiwan is worth further monitoring.

### **Limitation**

Despite the effort in collecting primary and secondary data through various official government channels such as blood donors, physical examination of potential military recruits, and claims data from Bureau of National Health Insurance, this study still was not able to obtain complete screening data from hospital physical examinations and non-government organizations that provided HIV screening service. As a result, the proportion of individuals screened among the population may be underestimated, and the analysis of the effect of screening may be limited.

### **Conclusion and Recommendation**

The National Association of People with AIDS in the United States started National HIV Testing Day more than a decade ago to encourage voluntary consultation and screening of HIV in susceptible high risk population and to raise the awareness of the general population about HIV. Currently, there are thousands of community-based service stations that provide HIV consultation and screening. On the National HIV Testing Day, health fairs and community and media campaigns are held to raise the awareness of the risk of HIV and promote the use of HIV screening, and to facilitate early diagnosis of HIV infection in the population.

It is without question that screening is one the fundamental strategies for disease prevention and control in public health practices. In the process of forming public health policies, cost-effectiveness is one of the major determinants in allocating available public health resources. The overall proportion of individuals screened in Taiwan was 16.2%. We suggest that efforts should be made to improve the rate of screening and facilitate early identification of HIV-infected cases. In addition to continuing the existing education, consultation and screening programs among susceptible high risk population, in the future, strategies such as expanding the number of health care facilities that provide anonymous or non-anonymous screening using the resources currently available, providing multiple channels of screening and convenient accessible screening sites, or mass HIV screening campaigns should all be considered in order to strengthen the concept of HIV prevention and promote the use of HIV screening in the population.



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## Investigation of the First Two Novel Influenza A (H1N1) Cases in Middle Taiwan

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## Abstract

Since early April of 2009, the novel Influenza A (H1N1) spread from America to the whole world. Epidemic prevention system in Taiwan responded to block against this

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emerging infectious disease from threatening people's health. At that time, epidemic prevention actions showed great differences among countries based on medical and public health resources. Following epidemic progression and understanding the disease better, there were various prevention actions at different time. This article described the epidemic prevention and clinical treatment of the 10<sup>th</sup> and the 11<sup>th</sup> (the 1<sup>st</sup> and 2<sup>nd</sup> in middle Taiwan) of novel influenza A (H1N1) cases in Taiwan. The actual implementation of management, thinking, and medical treatment were recorded under the epidemic prevention system of Taiwan at that time.

## Introduction

Since early 2009, the swine Influenza A (H1N1) spread from America has brought the attention of every country [1]. On April 25, WHO announced that swine influenza A (H1N1) was an "internationally renowned public health event" by International Health Regulation (IHR). It rapidly spread to the whole world through its high transmissibility. Later, WHO announced the scale of outbreak caused by pandemic influenza A (H1N1) had arisen to the highest phase 6 on June 11.

Following the global spread of novel (H1N1) influenza outbreak, the epidemic prevention system of Taiwan responded fully aimed to protect people's health. Taiwan CDC announced the novel (H1N1) influenza as a category 1 communicable disease on April 27, and established Central Epidemics Command Center (Command Center) on April 28 [2, 3]. Several measures were conducted including enforcement of quarantine on arrival passengers, implementation of boarding

quarantine, and releasing stocked masks [2]. Under these strict epidemic prevention measures, the first novel (H1N1) influenza case was detected on May 20 from a foreigner [4]. This article described the epidemic prevention actions and medical treatment course of case 1 on the 5<sup>th</sup> day (May 25) and case 2 on the 8<sup>th</sup> day (May 28) after the first case.

## Case 1

### Case description

This was the 10<sup>th</sup> case of Taiwan and also the 1<sup>st</sup> novel (H1N1) influenza case in middle Taiwan. This case was a 26-year-old male who had no job and lived in Tsaotun Township, Nantou County. He had no underlying disease and did not receive influenza vaccine last year, or Pneumococcus vaccine.

He traveled to Guizhou Province, China, during May 13 to 23. Two days later after returned home in Tsaotun Township (May 25), he felt tired, and went to Nantou Hospital, Department of Health seeking for medical advice. He had sample collected and received treatment in a simple isolation ward at Emergency ward. Because of his clinical signs and travel history – has been to a country with novel (H1N1) influenza cases, he was suspected to have infected by novel (H1N1) influenza virus, so he was shifted to a negative pressure isolation ward the next day for treatment. Medical personnel at hospital wore N95 masks, isolation gowns, gloves, and caps while taking care of the patient either in simple isolation ward or negative pressure isolation ward.

Case showed symptoms of cough, rhinorrhea, fever, and tiredness. Chest X ray

revealed mild infiltration over bilateral lung. Symptom of tiredness has significantly improved on the 2<sup>nd</sup> day of hospitalization. Besides, activity and mental condition were normal during hospitalization, and oxygen ventilator was unnecessary. Body temperature was 39°C on May 25 and lasted for 2 days. After May 27, body temperature was normal. C-reactive protein of the case was 1.3mg/dl, blood sugar was 94mg/dl, WBC was  $3.6 \times 10^3/\mu\text{l}$  (Neutrophils 31.4%, Lymphocytes 41.6%, Monocytes 23.2%), and platelet was  $240 \times 10^3/\mu\text{l}$ .

While hospitalization, throat swab and serum were collected and sent to Research and Diagnostic Center, CDC for examination by special car of 3<sup>rd</sup> Branch, CDC. On May 26, polymerase chain reaction (PCR) confirmed he was a novel (H1N1) influenza case. He was treated with Tamiflu and followed the recommended dose for 5 days.

During hospitalization, following the decision from Command Center, throat swabs were sampled every day after temperature coming down and sent for reexamination. The discharge criterion is based on the two consecutive negative PCR results from throat swab. Further, attending doctor telephoned medical officer in Command Center and the Commander of Infectious Disease Control Medical Network in middle Taiwan every day to explain the patient's clinical condition. Aside from May 25, the PCR result was positive on May 27 but negative on May 29 and 30. In addition, there was significant improvement on patient's clinical condition, so he was discharged under agreement of the hospital.

#### **Investigation of travel and contact history:**

From May 13, 2009, case and his father joined a tour group led by One-in-one travel agent and went to a trip in Guiyang City, Anshun City, and Huangguoshu City, Guizhou Province, China. There were 18 people in total including the leader, among the group, there were 4 from northern Taiwan, and others were from middle Taiwan. After the tour ended, they took Hong Kong Airline from Guizhou to Hong Kong on May 22; after 3 hours waiting for the connection flight, they took China Airline and arrived in Taiwan at 1 o'clock in the morning on May 23. There was no fever when he walked through the fever screening station at Taoyuan Airport. According to his own statement, he did not discover or contact with any respiratory infected person during the travel, all passengers had to measure body temperature before boarding in Guizhou Airport, and no one had fever. During waiting for the connection flight in Hong Kong, he and his father kept distances with people sedulously and wore surgical masks to avoid getting infected aside from shopping in two stores at the airport. The case and tourists of the same travel group claimed that there was no passenger having significant illness or respiratory symptom on the two flights from China to Taiwan.

After came back to Taiwan on May 23 until ill on May 25, he had been to Taichung meeting friends and relatives and also went to a computer class in Taichung City. Epidemic investigation did not discover any respiratory infection sign among his parents who living with case, 3 relatives, friends, teacher and classmates (26 people in total). None from the 16 tourists (not including case and case's

father) showed any respiratory symptoms either. These contacts were all requested to do Health Self-Management for 7 days.

The epidemic prevention strategy of the case was decided after discussion among Command Center, 3<sup>rd</sup> Branch of CDC, and Commander in middle Taiwan, which contained the scope of epidemic investigation, sampling, and prophylaxis medication. Calculating from date of onset, this novel (H1N1) influenza case probably would not cause infection to other guests on the same flight, and it is possible that the case was infected after came back to Taiwan (even if there was no community infection proved at that time), so tracking upper respiratory infection of guests at the same flight was unnecessary. All contacted people were not required for throat sampling and test, but his close contacts including parents and one relative had been given prophylaxis medication for 10 days.

Command Center informed Hong Kong and China through IHR focal point on this case. Because there was no definite infection source detected in the epidemic investigation and the case had stayed in Hong Kong Airport waiting for 3 hours, the Centre for Health Protection of Hong Kong concerned whether the case was infected in Hong Kong. Therefore, the Centre, with Command Center and medical officers of 3<sup>rd</sup> Branch of CDC held teleconference in the afternoon on May 28, discussing over the contact history of the case including all details while staying in Hong Kong Airport.

## Case 2

### Case description:

The 19-year-old female was the 11<sup>th</sup>

novel (H1N1) Influenza case in Taiwan and the 2<sup>nd</sup> case in middle Taiwan, with family registered in Mingjian Township, Nantou. She studies in Massachusetts, the U.S.A.; she has no underlying disease and received seasonal influenza vaccine in the States during March, 2009, but never inoculated with Pneumococcus vaccine.

She flew from Boston in the morning on May 26 through Chicago and Japan Narita Airport and arrived in Taoyuan Airport in the evening on May 27. While taking bus to Nantou near midnight, she felt fever and cough. The next morning (May 28), she showed rhinorrhea, sneezing, wet cough, fever, malaise, and myalgia. Then she went to Nantou Hospital with her uncle and families, her body temperature was 39.7°C at that time. Because of the suspected influenza symptoms and she came from America where novel (H1N1) influenza was prevalent, so she was suspected to have novel influenza infection. After examination and sample collection in a simple isolation ward, she was shifted to a negative pressure isolation ward at Chungshin campus of Nantou Hospital the same day.

While hospitalization, her chest X-ray showed no significant unusual change. Her body temperature was 39.7°C on the day of hospitalization, but only slightly fever (37.5°C to 38°C) for the next two days. Besides, her consciousness was clear. Her C-reactive protein was 1.3mg/dl, WBC was  $10.1 \times 10^3/\mu\text{l}$  (Neutrophils 82.1%, Lymphocytes 7.1%, Monocytes 8.9%), and platelets was  $230 \times 10^3/\mu\text{l}$ . The glutamic pyruvic transaminase was 18 IU/l, creatine phosphokinase was 65 IU/l, and creatine kinase was 0.8 IU/l. According to the results and clinical symptoms,

she had mild striated muscle inflammation.

Her throat swab was sent by special car to Research and Diagnostic Center, CDC for test and was confirmed as infection by novel (H1N1) influenza virus. The case started treatment with Tamiflu since May 28, during this period, the attending doctor contacted with Command Center and Commander of middle Taiwan by telephone every day. Because of the stable clinical condition and two consecutive negative PCR results of throat swab on June 1 and 2, she was discharged on June 3.

#### **Investigation of travel and contact history:**

This case lived in relative's house in Massachusetts, the U.S.A., for one week before flying back to Taiwan. Although she shopped in a mall during the visiting time, there were no people having respiratory infection symptoms among contacted people including relatives and families. She took a flight at 8:00 am on May 26 from Boston, Massachusetts to Chicago, flew from Chicago to Japan Narita Airport at noon on the same day, and arrived at Narita Airport about 3:00 pm on May 27 in Japan. When arriving, Japanese boarding quarantine discovered a Japanese female passenger who was 2 rows from her having respiratory infection signs and that woman was taken away from the plane for examination by Japanese quarantine personnel. By contacting IHR focal point later, the Japanese female was ruled out as a novel (H1N1) influenza infection. Further, there was one guest who was 2 seats away from her having slightly cough symptom, but no rhinorrhea or fever.

After getting off the plane she did not enter Japan, she transferred to a flight about

5:00 pm and arriving at Taoyuan Airport about 9:00 pm on May 27, fever screening at quarantine station did not discover her with fever. She started to have fever and some cough on the bus backing to Taichung near midnight. She gave an account of wearing mask on the whole journey from the flight in America to home.

She lived with her father, mother, and younger brother. During the 7 days, after contact with the case, her families and uncle did not show upper respiratory infection. The bus driver was found having respiratory symptoms later the same day, he was found not having infection after examination. After discussion among Command Center, the 3<sup>rd</sup> Branch, and Commander in middle region, public health authority requested the guest list and seating order of that flight from the airline company, and further obtained the communication information from National Immigration Agency of the Ministry of the Interior. From her seat 3 rows at front to 3 rows behind, 7 rows in total, there were 59 people considered as close contacts, they were under investigation and requested to do Health Self-Management. These passengers showed no upper respiratory infection sign before flight and even 7 days after arrival.

In the process of epidemic investigation and prevention, all contacts were not sampled for examination. Her family members (father, mother and brother) and her uncle, who accompanied her to Nantou Hospital, were given prophylaxis medicine Tamiflu for 10 days.

#### **Discussion**

The clinical management, investigation

of travel and contact history, and prevention experiences on these first two novel (H1N1) influenza cases in middle Taiwan had following features and meanings: 1) there were great differences in the responses in the clinical and public health strategy between countries when facing the emerging novel (H1N1) influenza; management experiences of these two cases were recorded to reflect the preparedness and response of epidemic prevention system and medical system of Taiwan at the time when facing novel (H1N1) influenza outbreak; 2) management of these two imported cases of newly emerged disease involved cooperation of multiple countries; under the less visible international boundary, necessity of international cooperation in epidemic prevention becomes more important; 3) these two cases did not cause second wave of infection in Taiwan area, the management experiences offered a reference for further epidemic prevention strategy; and 4) the infection sources of these two cases were not found, this explains the high transmissibility of novel (H1N1) influenza virus and it is difficult to prevent, also suggested that there were considerable number of unconfirmed novel (H1N1) influenza cases spread in communities globally.

From the beginning of 2009, prevalence of novel (H1N1) influenza from Mexico was extremely fast [1]. Even though countries around the world have spent great amount of resources preparing for influenza pandemic several years ago, there were still a lot of differences between countries when facing 2009 pandemic (H1N1) influenza. The differences were from geographic location, medical system, and government system of

countries. An important difference was the scale of outbreak varied in countries. For example, till May 2009, there were 41 states in America reported the discovery of this virus, and its severity was much milder than human H5N1 influenza, more like the manifestation of seasonal influenza [5]. The novel (H1N1) influenza was listed as the category 1 communicable disease on April 27. Since Taiwan just detected the 1st novel (H1N1) influenza case 5 days before (May 25) the case 1 in middle Taiwan [4]. As the result, when managing the outbreak of these two cases, public health personnel treating it as a high pathogenic influenza infection at the beginning, adopting strategy of blocking to prevent the disease from spreading.

However, following the epidemic development and thorough understanding of the disease from WHO, some specialists started to consider the high mortality and severity of novel (H1N1) influenza spread from Mexico was over estimated [6]. Mortality of local infection in Mexico has been estimated again as 0.4% (range: 0.3% to 1.8%), which was equaled to the influenza pandemic in 1957. Command Center continues evaluating and changing epidemic strategies while facing novel (H1N1) influenza, these changes also reflected in the epidemic prevention and clinical management of the 2 cases. For example, although they were placed in negative pressure isolation wards of hospitals, the personal protecting equipments of medical personnel were simple isolation gown instead of level C protection gown. Also, passengers of flight from Hong Kong to Taiwan in the first case were not included in epidemic investigation and tracing.

Contacts of the 2 cases, aside from close contacts, were not given prophylaxis medication.

Quarantine strategy of each country was different can be seen by epidemic investigation of the 2 cases. The first case had to describe physical condition to local quarantine personnel and measure body temperature before getting on airplane from Guizhou to Hong Kong to ensure there was no guest who having fever or illness. When transiting in Hong Kong, passing through quarantine station is necessary before fly back to Taiwan. In the case of second case, before leaving America, there was no quarantine control at the airport, so case can board directly. Before she got off airplane at Narita Airport, Japanese quarantine officers had to conduct boarding quarantine. Passengers with suspected symptoms had to be taken away from the plane for further examination. Passengers seating several rows forward and backward from the taken passenger were requested to leave addresses of travel destination and contacting methods. The 2 cases all had to pass through quarantine control and infrared fever screening when arriving in Taiwan. But these 2 people did not feel ill or having fever when arrived, so they could pass through quarantine station at Taoyuan Airport. To face the novel (H1N1) influenza, before and after these 2 cases, many countries had no effective quarantine strategy for arrival passengers. Asian countries had experience with the SARS outbreak, so relatively more resources had been invested in custom quarantine, and equipments research and development [7]. Quarantine strategy and fever screening at

arrival and departure could slow the spread of emerging infectious disease, but we still need more experience and evidence to evaluate the effectiveness of current quarantine strategy.

Control measures of the 2 cases manifested the value and necessity of international cooperation. The importation and exportation of infectious disease became more frequently through international traveling. Taiwan has followed regulations of IHR to implement public health work several years ago and officially joined IHR system in the beginning of 2009 [8]. In the first case, Command Center informed the world through IHR focal point, which brought the concern of Hong Kong. Command Center and Hong Kong discussed this case by telephone meeting, which enhanced the international cooperation experience of public health. In the second case, going through IHR focal point, understanding of the possible contact history in Japan and America becomes available, which was an important support of strategy in Command Center. Under the regulations of IHR and international connection, the control measures of the 2 cases were finished more completely and more effectively.

In summary, the recording of these two cases reflected the decision on epidemic prevention strategy of Command Center and medical treatment for patient under the rapid changing of global epidemic prevention strategies at that time. Management of the 2 cases demonstrated the real experience of preparedness and response of influenza pandemic in middle Taiwan, this also offered as a reference to determine an epidemic prevention strategy in the future.

## References

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