疫情報導 Taiwan EB

Taiwan Epidemiology Bulletin

Biweekly

January 25 , 2011/ Vol.27 / No.2

Study on the Notification of Imported Cases of Notifiable Diseases by Using the Data in the National Health Insurance Information System during 2007-2008

Chien-Hua Chu, JihChing Huang, Ya-Ling Chen, Che-Chieh Yen

Fifth Division, Centers for Disease Control, Taiwan

Abstract

In order to know the medical service and disease notification associated with travelers after returning from abroad, we analyzed three notifiable diseases, i.e., dengue fever, amoebiasis, and shigellosis, with the largest number of imported cases during 2001-2008, by cross-checking the data collected between 2007 and 2008 in the Bureau of National Health Insurance Information System, the Self Health Management sub-System under the Border Quarantine Information System, and the National Notifiable Disease Surveillance System. The analysis found that among the cases reported as a diagnosis of dengue fever, amoebiasis, and shigellosis were 171, 46, and 47 cases, respectively, in the Bureau of National Health Insurance Information System during the study period, who had the entry history and ever sought medical service within a certain period after returning home. Of these cases, 158 (92.4%), 9 (19.1%), and 17 (35.4%) for dengue fever, amoebiasis, and shigellosis, respectively, have been reported to the National Notifiable Disease Surveillance System.

The imported cases of notifiable diseases are closely related to the risk of epidemic outbreak and the efficiency of disease control. This study provides an overview on the incidence of major imported cases in recent years in Taiwan, and offers an important reference in formulating a communicable disease surveillance policy for the purpose of preventing the impact of imported cases on the disease control system.

Keywords: National Notifiable Disease Surveillance System, dengue fever, amoebiasis, shigellosis

Introduction

Infectious diseases know no boundaries. The increase in number and frequency of international contact and international traveling of Taiwan citizens has become a

INSIDE

The Taiwan Epidemiology Bulletin series of publications is published by Centers for Disease Control, Department of Health, Taiwan (R.O.C.) since Dec 15, 1984.
Publisher : Feng-Yee Chang
Editor-in-Chief : Min-Ho Lai
Executive Editor : Li-Gin Wu, Hsiu-Lan Liu
Telephone No : (02) 2395-9825
Address : No.6, Linshen S. Road, Taipei,Taiwan 100 (R.O.C.)
Website : http://teb.cdc.gov.tw/
Suggested Citation :
[Author].[Article title].Taiwan Epidemiol Bull 2011;27:[inclusive page numbers].

serious challenge to infectious disease control. For example, a cluster of *shigellosis* infections was identified in a tour group returning from Bali island in Indonesia in November 2003, which 38 cases were confirmed [1]; and, 10 cases of dengue fever were detected among 11 members of a religious group coming back from Myanmar in summer 2008 [2]. Some emerging and reemerging infectious diseases occurred in recent years, such as SARS and novel influenza A (H1N1), and disease seasonally occurred in Taiwan, such as dengue fever, have formed an unignorable and serious challenge to the disease control system of public health practices. Communicable disease surveillance system is an alert mechanism important to the prevention of disease from spreading and to the avoidance of epidemic in this country. U. S. Centers for Disease Control and Prevention defines the surveillance as a systematic and continuous collection, collation, and analysis of data for public health purposes, and the dissemination of information on public health in timely fashion for those of being able to undertake evaluation of issue in public health and to take response actions for these issues. Therefore, communicable disease surveillance is in fact to work through the continuous collection, analysis, interpretation, and description of relevant information on disease occurrence to finally reach the purposes of effective control of communicable disease epidemics [3].

To decrease the possibilities of an epidemic caused by imported cases, especially emerging diseases, the most important measure is to early detect the suspected cases and track the records of medical care sought by the travelers within a certain period after arrival. The border quarantine measures currently performed in this country include fever screening for all incoming passengers, active notification through the Communicable Disease Survey Form for travelers with fever or other symptoms caused by implicated communicable diseases, and taking specimens from suspected cases of communicable diseases. For cases becoming sick after returning to their communities, the monitoring and detection largely depends on the diagnosis and notification of physicians delivering medical service. Only through these surveillance and notification can the health workers catch the whole picture of disease occurrence and take actions for disease control. As the Taiwan government is enthusiastic in expanding the open policy for tourism and direct air flight between mainland China and Taiwan, the monitoring and control of imported cases seems to be more important and challengeable. Therefore, the information on clinic visit and notification of suspected imported cases, and the impact of the imported cases on current communicable disease surveillance system are worth being further understood and evaluated.

The purposes of this study are to understand the infection of citizens during traveling abroad and the situation of clinic visit when they get sick after returning, to evaluate the notification of suspected imported cases made by physicians, and, therefore, to provide information for reference in formulating communicable disease surveillance policy and to decrease the impact of imported cases to the disease control system.

Materials and Methods

A. Study materials

1. Data of citizens in the Self Health Management sub-System (SHM sub-System) under the Border Quarantine Information System operated by Taiwan CDC: Data of citizens returning from Southeast Asia countries, Japan, and mainland China during 1 January, 2007-31 December 2008 were collected for study. The basic data of the returning citizens in the SHM sub-system were provided by the National Immigration Agency of the Ministry of Interior by uploading them on a daily basis.
2. Data of patient with the diagnosis of selected diseases in the Bureau of National Health Insurance Information System (NHIS): Data of patients with the diagnosis of dengue fever (ICD-9 code 061), dengue hemorrhagic fever (ICD-9 code 065.4), shigellosis (ICD-9 code 004), and amoebiasis (ICD-9 code 006) in the NHI system were downloaded as study materials.
3. Data of patients diagnosed and notified as selected communicable diseasesin the National Notifiable Disease Surveillance System(NNDSS) operated by Taiwan CDC: Data of cases reported as dengue fever, shigellosis, and amoebiasis in NNDSS and the date of notification was during the period of 1 January, 2007 to 31 December 2008, were included in this study.

B. Methods for data cross-checking from different systems

The term ‘suspicious imported cases’ used in this study indicates the cases identified through cross-checking of data in the NHIS and SHM sub-System, which is different from ‘imported cases’ commonly used in the NNDSS. Since one patient may visit clinic several times for the same disease and a citizen may have several entry records during the study period, this study first used national identification number (ID) to find the patients with entry history by cross-checking the data in the NHIS and SHM sub-System. Next, in considering the incubation period for the disease and the average time interval from the date of disease onset to the date of clinic visit, the interval between the date of clinic-visit (or date of hospital admission) and the date of entry were used to screen the patients with entry history and ever seeking medical service within a certain period after entry, and thus to find and estimate the number of suspicious imported cases for one specific disease. The methods and steps are as follows:

1.Suspicious imported cases: A suspicious imported case for one specific disease means a patient who is diagnosed as a case of the disease within a certain period after entry. The certain period represents days of the incubation period of the disease plus seven days, an average interval for people to seek medical service after onset of disease.

2.To identify a patient who was diagnosed as a case of dengue fever, shigellosis, or amoebiasis in the NHIS (file A). The ID of the case in file A was used to cross-check with citizen's data in the SHM sub-System to find a case that has both entry history and clinic visit records (file B).

3.The days of incubation period for dengue fever, shigellosis, or amoebiasis (8, 31, and 3 days, respectively) plus seven days was used to cross-check data of cases in file B. A cases with the time interval between the date of diagnosis and the date of entry occurred within 15, 38, and 10 days were considered as suspicious imported cases of dengue fever, shigellosis, or amoebiasis, respectively (file C). Then, an epidemiological analysis was conducted for cases in file C.

4.To identify suspicious imported cases of dengue fever, shigellosis, or amoebiasis that were reported to the NNDSS (file D), the ID of the patient and the date of notification were used to perform cross-checking of data in the file C and the data file of the dengue fever, shigellosis, or amoebiasis cases reported to the NNDSS during the study period.

5.The notification rate (%) of suspicious imported cases for each of the three diseases was calculated as the number of cases in file D divided by the number of cases in file C, multiplied by 100.

C. Data analysis: Microsoft Office Excel 2003 was used to establish data file and make graphs for further analysis.

Results

Based on the NNDSS maintained by Taiwan CDC, a total of 2,569 imported cases were confirmed during 1 January, 2001-31 December, 2008. The three diseases with the largest number of cases were dengue fever (873 cases or 34.0% of the total), amoebiasis (501 cases or 19.5%), and shigellosis (416 cases or 16.2%) (Figure 1) .

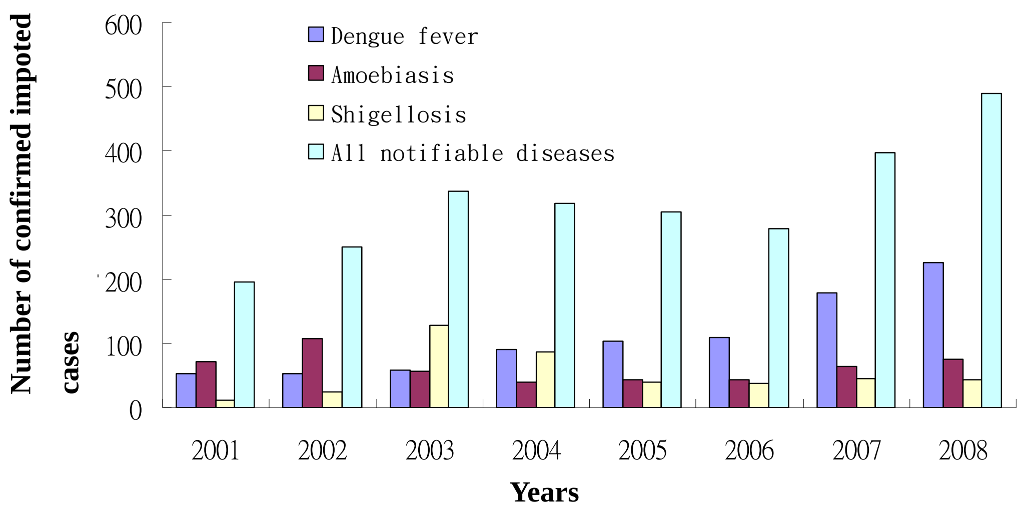

Figure 1. Number of confirmed imported cases for selected diseases in Taiwan, 2001-2008

During the eight-year period, the annual average number of imported cases was 321.1. The year with the lowest number of cases, 196, occurred in 2001. Then, the number of cases increased to 337 in the year 2003 and thereafter appeared in a trend of gradual decrease in number of cases. However, the number of cases had a dramatic increase in the year 2007 and reached to 489 cases in 2008. A 2.5-fold increase was found in number of confirmed imported cases in 2008, as compared with those in 2001.

Analysis on the three diseases with the largest number of confirmed imported cases shows that the number of imported dengue cases presented in an increasing trend and reached to 226 cases in 2008, a 4.5 fold growth during the eight-year period. For amoebiasis, the number of imported cases was 107 in 2002 and only 83 cases in 2008, the number of cases was up and down during the eight-year period. The number of imported shigellosis cases reached to a peak (128 cases) in 2003 but appeared in a decreasing trend in the following years, and only 43 cases were identified in 2008.

Based on the data obtained from cross-checking of NHIS and SHM sub-System, the number of the suspicious imported cases that diagnosed as dengue fever (ICD-9 code 061), shigellosis (ICD-9 code 004), and amoebiasis (ICD-9 code 006), and experienced illness onset within a certain period (15, 11, and 38 days for dengue fever, shigellosis, and amoebiasis, respectively) after entry was 171, 46 and 47 for dengue fever, amoebiasis, and shigellosis, respectively, during 2007-2008 (Table). The epidemiological observation for the three diseases is as follows:

Table. Analysis of suspicious imported cases for selected diseases in Taiwan during 2007-2008

		Dengue fever (%)	Amoebiasis (%)	Shigellosis (%)
No. of total cases		171(100)	46(100)	47(100)
Sex				
	M	112(65.5)	31(67.4)	28(59.6)
	F	59(34.5)	15(32.6)	19(40.4)
Age				
	≤19	16(9.4)	2(4.3)	9(19.1)
	20-29	15(8.8)	3(6.5)	3(6.4)
	30-39	25(14.6)	13(28.3)	11(23.4)
	40-49	39(22.8)	13(28.3)	5(10.6)
	50-59	49(28.7)	8(17.4)	13(27.7)
	≥60	27(15.8)	7(15.2)	6(12.8)
Reported to NNDSS				
	Yes	158（92.4）	9（19.6）	17（36.2）
	No	13（7.6）	37（80.4）	30（63.8）
No. of admissions		56	4	6
Average admission days （Range）		10.1 （2-33）	3.75 （3-5）	19.1 （6-39）
Average health insurance cost for hospitalization （Range）		6,604.6 （4,500-32,270）	11,425.8 （6,125-20,901）	35,494.5 （12,293-78,827）
Total health insurance cost for hospitalization		369,861	45,703	212,967
No. of outpatients		115	42	41
Average health insurance cost for outpatient care （Range）		634.1 （213-11,876）	825.1 （120-3,549）	3,361.7 （160-29,417）
Total health insurance cost for outpatient care		72,930	34,564	137,831

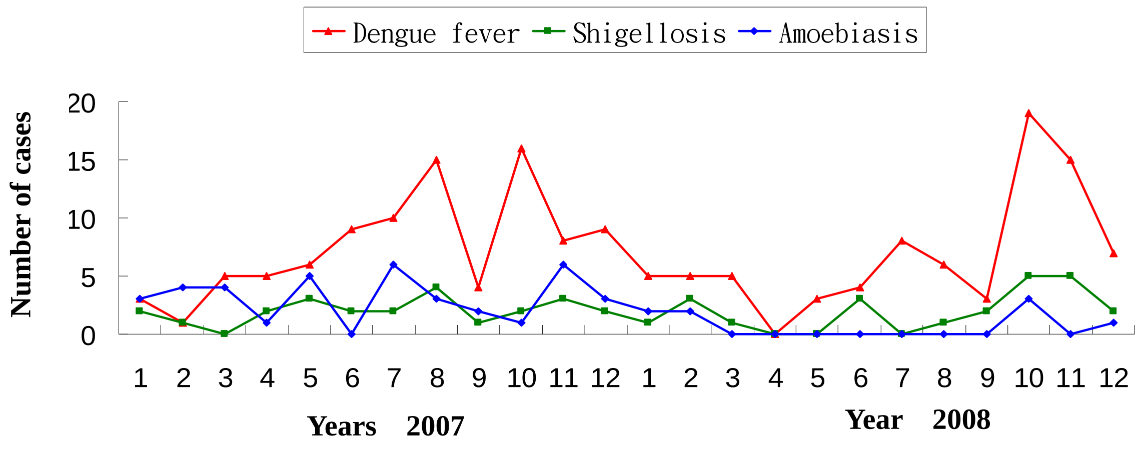

Figure 2. Number of suspicious imported cases in Taiwan, by month of arrival, 2007-2008

A.Dengue fever

1.Sex

Of the 171 cases, 112 were male and 59 female, and the ratio of male to female cases was 1.9:1.

2.Age

The age group with the highest number of cases (49 cases) was 50-59 years, followed by the age group of 40-49 years.

3.Month of entry

The highest number of cases, 35 cases, occurred among travelers arriving in October, followed by November, 23 cases, and then August, 21 cases, as shown in Figure 2.

4.Of the 171 cases, 56 have been hospitalized for treatment and a total of 369,861 NT dollars on health insurance cost have been spent, with an average of 6,604.6 NT dollars per patient.

5.The 115 cases treated through outpatient units have spent a total of 72,930 NT dollars on health insurance cost. The average cost was 634.1 NT dollars per patient.

B. Amoebiasis

1.Sex

Of the 46 cases, 31 were male and 15 female, and the ratio of male to female cases was 2.1:1.

2.Age

The age group with the highest number of cases was 30-39 years and 40-49 years (13 cases in each group), followed by the age group of 50-59 years.

3.Month of entry

The month having the most number of cases included February, July, November, and December, with 6 cases in each. The number of cases for other months is shown in Figure 2.

4.Of the 46 cases, 4 have been hospitalized for treatment and a total of 45,703 NT dollars on health insurance cost have been spent, with an average of 11,425.8 NT dollars per patient.

5.The 42 cases treated through outpatient units have spent a total of 34,654 NT dollars on health insurance cost. The average cost was 825.1 NT dollars per patient.

C. Shigellosis

1. Sex

Of the 47 cases, 28 were male and 19 female, and the ratio of male to female cases was 1.5:1.

2. Age

The age group with the largest number of cases (49 cases) was 50-59 years, followed by the age group of 40-49 years.

3. Month of entry

The month with the largest number of cases, 8 cases, was August, followed by July, 7 cases. Figure 2 shows the number of cases for other months.

4. Of the 47 cases, 6 hospitalized for treatment have spent a total of 212,967 NT dollars on health insurance cost, with an average of 35,494.5 NT dollars per patient.

5. The 41 cases treated through outpatient units have spent a total of 137,831 NT dollars on health insurance cost. The average cost was 3,361.7 NT dollars per patient.

Of the 171 suspicious imported dengue cases, 158 have been reported to NNDSS, with a notification rate of 92.4%. The notification rate for amoebiasis and shigellosis was 19.6% (9/46) and 36.2% (17/47), respectively, as shown in Table.

Discussions

Previous study indicated that dengue fever was considered as the most important disease in southern Taiwan and the third important disease nationwide in a self-evaluation program that health workers in countries/cities were required to rank the importance in terms of the disease control works for the notifiable communicable diseases in their administrative areas [4]. Therefore, dengue fever has been the focus of disease control to the health authorities. The main characteristic of fever for dengue fever makes the disease easily be detected through fever screening procedures. This is probably the reason why the notification rate of dengue fever cases among the travelers returning from abroad and, within a certain period after arrival, being diagnosed as dengue fever during 2007-2008 reaches as high as 92.4%, apparently higher than that for shigellosis (36.2%) and amoebiasis (19.6%).

A low notification rate for amoebiasis and shigellosis was found in this study. It is speculated that this may result from the ignorance of regulations or not knowing what disease shall be notified. Previous studies indicated that the reasons for physicians not notifying include ignoring the regulatory requirement, not knowing what disease shall be reported, not knowing how to notify, and assuming that somebody else would notify [5-7]. In addition, the characteristic of disease may also influence the case notification rate. The diagnosis of amoebiasis in tradition is based on the finding of trophozoites or cysts in the fecal specimens or sections of tissues through microscopic examination. However, previous study showed that the positive rate was only about 70 percent even if examinations have been repeatedly performed for several specimens collected from same patient in different time [8]. As a result, the false negative case in the remaining 30% may become a factor elevating the risk of amoebiasis cluster infection. Moreover, owing to the long incubation period, from 28 days to several years, for amoebiasis, the patient usually would not be considered as a case of notifiable communicable disease when they become ill so the health workers will be unable to initiate interventions in time.

In order to effectively allocate resources, the target population to whom the requirements of filling out the Communicable Disease Survey Form at border entry point has been changed from all the incoming passengers to only those of passengers who were detected with specific symptoms or who actively reported illness to the quarantine officers since December 2004. This change has ultimately resulted in a significant reduction in the number of shigellosis cases detected at border entry points [9]. Therefore, the notification from physicians in the community will become an important defense line in terms of preventing the imported cases from causing an endemic infection. Data in this study shows that 17 of the 47 suspicious imported shigellosis cases have been reported to the NNDSS, with a notification rate of 35.4%. The previous study mentioned that among the 100 patients infected with shigellosis, 76 will present symptoms, 28 will visit clinic for medical care, 9 will have fecal specimens taken, 7 will have a positive test result, 6 will be reported to local health authorities, and 5 will be notified to the nation's center for disease control [10]. Taking as an example, if imported cases of shigellosis in members of tour group returning from abroad are not notified in time, the diseases will spread to other contacts in different counties within a short period when they return to their communities. As a result, the health authorities will need to spend more manpower in order to initiate the follow-up for the contacts, leading to a high burden on health workers. Therefore, if the imported cases are not notified by physicians in the communities in time, they will produce an impact on the disease control system and elevate the risk of a large scale outbreak. If the diseases are not well and timely controlled, the burden on social cost will be more than the dengue fever. [4]

The working procedures of border quarantine for dengue fever in Taiwan currently are detection of suspected dengue cases through the infrared fever screening system at international ports, information of the suspected cases was recorded into the Border Quarantine Information System maintained by Taiwan CDC, and follow-up of the suspected cases for ten days from the date of entry by local health authorities where the cases are living. During the follow-up period, health workers will call the cases on a daily basis to update the information on health condition and the medical service use. The fever screening stations at the border entry points were originally established for identifying passengers with fever symptoms for possible SARS (Severe Acute Respiratory Syndrome) cases. When SARS epidemic is ended, the focused disease for the fever screening was shifted from SARS to other diseases with a relative high efficiency in terms of case finding, such as shigellosis and dengue fever. As a result, the number of cases detected through fever screening for these diseases is significantly increased [11]. However, for passengers without fever symptoms at border entry point, the above-mentioned fever screening will be unable to function. The notification rate of 92.4% for dengue fever in this study represents that the problem of underreporting for dengue fever is less serious, in contrast to other diseases. A further analysis on notification source of cases in NNDSS will allow us sufficiently understand what are the possible surveillance mechanisms that were used for case report.

From the analysis of data in the NNDSS, the number of diseases with imported cases was as many as 34 during 2001-2008. The number of cases of the three diseases with the largest number of cases accounted for 69.7% of total number of cases. Although the number of cases of other diseases is small, we should still stay on high alert since even an imported case is likely to result in an outbreak. For example, the health authorities in Tainan County and Tainan City received reports of several suspected measles cases between late February and early March 2009, and the epidemiological investigation confirmed that the source of infection was a case imported from Vietnam. The index case was a female, less than one year old, who was accompanied by her mother visiting relatives in Vietnam. The investigation showed that she was infected with measles virus in Vietnam and caused two waves of nosocomial infection in the emergency room in Tainan County while receiving medical care. A total of 2 medical care providers and 5 hospital visitors were infected in this cluster [12]. If the disease belongs to a more serious one, the costs for disease control and the resources for medical care will be huge, such as the SARS epidemic in 2003. Although the number of imported SARS cases for the whole year was much less than that of dengue fever, the impact to the society was an inerasable memory for people experienced.

As mentioned above, the cross-check of data in the NHIS and SHM sub-System will allow us to detect suspicious imported cases at the time before the notification by physician. Moreover, this approach will let us to prevent the infected incoming passengers, without fever at border entry point, from becoming the infection source in community, and to reach the policy goal of early detection and timely intervention. However, real-time data in the NHIS were not provided at the current time. Therefore, the establishment of timely surveillance system will first need to solve the technologies on immediately sending the data of patient with health insurance to NHIS. Another limitation is that the suspicious imported cases identified in this study contain only the patients with health insurance. The patients without health insurance and foreigners staying in Taiwan, such as foreign labors, are not included in the NHIS. Therefore, except the data in the NHIS, if more data sources regarding the patients' medical record are available, the epidemiological analysis of the diseases with imported cases will be more complete. Nevertheless, the methods and steps created in this study for cross-checking of data in different databases still can be used as a model for the evaluation of notification efficiency of the NNDSS. In the future, if a further analysis of disease notification can be conducted for individual hospital or hospitals categorized on the basis of the characteristic or ownership, such as public or private hospitals, teaching hospitals in different levels, and hospitals in different administrative regions, we will know the reasons causing a low notification rate in some hospitals so that assistance can be provided to these hospitals.

We suggest that, at the present stage, the dissemination regarding the prescriptions of the Communicable Disease Control Act and the operation of related notification system should first be improved and then the low notification rate for some diseases mentioned in this study, e.g., shigellosis and amoebiasis, can be enhanced, so that the control action can be triggered in time to prevent further spreading of epidemic and to mitigate the impact of the epidemic on the national disease control system.

References

1. Taiwan CDC. News Press Releases. 2003, Dec 12. Available at http://www.cdc.gov.tw/content.asp?cuitem=1192&mp=1
2. Taiwan CDC. News Press Releases. 2008, July 30. Available at http://www.cdc.gov.tw/ct.asp?xItem=17855&ctNode=220&mp=1
3. CDC. Guidelines for Evaluating Surveillance Systems. MMWR 1998;37: 1-18.
4. Chiul CH, Chang YM, Hung MN, et al. Disease burden analysis and cost effectiveness evaluation to analysis the actuality resources efficacy of the notifiable disease prevention in Taiwan. Available at: http://www.cdc.gov.tw/public/data/922716334871.pdf
5. Harvey I. Infectious disease notification. A neglected legal requirement. Health Trends 1991;23:73-4.
6. Voss S. How much do doctors know about the notification of infectious diseases? BMJ 1992;304:755.
7. Doyle TJ, Glynn MK, Groseclose SL. Completeness of notifiable infectious disease reporting in the United States: An analytical literature review. Am J Epidemiol 2002; 155:866-74.
8. Stark D, van Hal S, Fotedar R, et al. Comparison of stool antigen detection kits to PCR for diagnosis of amebiasis.J Clin Microbiol 2008 ;46(5):1678-81.
9. Kuo JS, Lee HM, Wang JT, et al. Trend of fever screen and evaluation of quarantine effectiveness among international passengers to Taiwan during 2003-2007. Taiwan Epidemiol Bull 2008;24:443-58.
10. Rosenberg ML, Marr JS, Gangarosa EJ, et al. Shigella surveillance in the United States, 1975. J Infect Dis 1977;136: 458-60.
11. Chien HY, Lee HM. Effectiveness of fever screening station at Taoyuan International Airport. Taiwan Epidemiol Bull 2008; 24:38-50.
12. HJ Lin, et al. Measles Cluster in Tainan Area, Early 2009 .Taiwan Epidemiol Bull 2010;26:12-25.

Manpower Integration Program Review for Community Epidemic Prevention

Hsueh-Mei Lee, Mei-Hui Lin, Shu-Mei Chou, Chang-Hsun Chen

Fourth Division,
Centers for Disease Control, Taiwan

Abstract

In response to the demand of community epidemic prevention for influenza pandemic, Taiwan CDC mapped out the “Manpower integration program for community epidemic prevention” since

2008. Throughout 2008 and 2009, a total of 22 counties and cities had been subsumed in this program, including 16 participating for two consecutive years. By means of statistical analysis, it demonstrated that the counties and cities involved in the program had higher achieved rate in introspection for citywide manpower deployment and operation in epidemic control. Moreover, as longer they participated in this program, they would get a higher and helpful approval of program implementation in community pandemic prevention, and more assentient attitude to program promotion. A positive correlation, in terms of confidence in assisting community pandemic prevention, is observed with more number of volunteer types. That was because strengthening bonding between volunteers by network construction, and thus enhanced the bridging among different fields to bring supportive effects to each other. After discussion comes down, the community volunteers integrating program conduces the promotion of community epidemic prevention and should be continuously advanced. However, the capacity of integration in some counties is still improvable that should be kept on integrating and made good use of resources from various governmental departments and private organizations. As for professional training of volunteers, should be shifted from quantity to quality. In addition, in order to build the ability of volunteers respond to the demand in future epidemic, establish the qualitative indicators of community response in pandemic preparedness is necessary.

Keywords: community epidemic prevention, manpower integration for community epidemic prevention, volunteer groups

Introduction

Community epidemic prevention is the third defense line of our response to the influenza pandemic. The assessment from Richard Coker, London School of Hygiene and Tropical Medicine, on Taiwan's pandemic preparation in early 2007 based on Taiwan's Influenza Pandemic Strategic Plan (2007 edition), he recommended to find improvements included the role of volunteer groups [1].

Centers for Disease Control, Taiwan (Taiwan CDC) hence in 2008 revised Influenza Pandemic Strategic Plan that subsumed the volunteer groups and first time brought the community volunteer concepts into influenza pandemic preparation. By way of the autonomy of volunteers, communities gain abilities of self-care, maintain basic function, and assist in community order and safety during the influenza pandemic. Taiwan CDC also initiated a pioneer project in 2008 to promote "Manpower integration program for community epidemic prevention" with the collaboration of some local governments. Those county and city governments combined the existing community resources in their domain, established a regional network and organizations mobilization mechanisms, and conducted training regarding infectious diseases prevention in order to enhance knowledge of infectious diseases prevention, as transmitting media to deliver preventive messages in peacetime and transformed into prevention volunteers when a pandemic occurs.

To understand the implementation of the "Manpower integration program for community epidemic prevention", Health Bureaus were requested to fill out the evaluation forms of "The responses of community volunteer group to pandemic influenza H1N1", combined with the assessment from program participants in 2008 and 2009 as references of setting future community prevention policies.

Materials and Methods

A. Study object

Current community manpower integrated from counties and cities include village chief of civil affairs system; volunteer groups of governmental departments, such as volunteers involved in dengue fever, health care, and disease prevention; volunteers of Environmental Protection Agency, Fire department, and Police department; manpower from community development associations, community health promotion centers and other non-governmental organizations. Throughout 2008 and 2009, a total of 22 counties and cities had been subsumed in the "Manpower integration program for community epidemic prevention", including 16 participating for two consecutive years. The average manpower integrated in the two years was 13,589 people and 701 volunteer groups. Population and the number of townships in each counties and cities were downloaded from the Statistics Department, Ministry of the Interior.

B. Research tools

1. Evaluation forms of "The responses of community volunteer group to pandemic influenza H1N1" filled by 25 counties and cities. The items include the integrating/establishing the list of community volunteer support network (containing the number of volunteers and groups), establishing connection and communication mechanisms of community volunteer groups, planning to complete the operation of community volunteer groups, services of community volunteer groups (local services), benefit of "Manpower integration program for community epidemic prevention" for counties and cities in community response to influenza pandemic prevention, agreement of proceeding the plan implementation, confidence of assisting in implementation of community pandemic prevention (including the reasons of manpower loss).
2. Implementation outcomes of "Manpower integration program for community epidemic prevention" for counties and cities involved in 2008 and 2009.

C. Research methods

Use SPSS 14.0 to describe and cross-analysis the evaluation forms of "The responses of community volunteer group to pandemic influenza H1N1" filled by 25 counties and cities, and implementation outcomes of "Manpower integration program for community epidemic prevention" for counties and cities involved in 2008 and 2009. The results were expressed as a percentage.

Results

A.Establishment and operation of community epidemic prevention manpower

1.The establishment and grouping for community epidemic prevention manpower (Table 1)

In the counties and cities participated in 2008 (N = 19), 15,289 persons were established as community epidemic prevention manpower with an average of 804 persons (ranged 117 to 3,924). The average of manpower per 100,000 populations was 117 persons (ranged 6 to 511). Lienchiang County (less than 10,000 population) had 117 persons as manpower. Total 942 teams were set for community epidemic prevention manpower with an average of 52 teams (ranged 12 to 208); 17 counties and cities had at least one team in each of their villages, towns and districts, accounted for 94%, with an average of 17 persons per team.

Table 1. Number of team and manpower in counties and cities integrated community epidemic prevention in 2008 and 2009

County /City	2008						2009					
	No. of village / town	No. of team	No. of team per village/ town	population	manpower	Manpower per 100,000 populations	No. of village/ town	No. of team	No. of team per village/ town	population	manpower	Manpower per 100,000 populations
A	12	12	1	2,622,923	152	6	12	12	1	2,607,428	176	7
B	29	92	3	3,833,730	805	21	29	87	3	3,873,653	867	22
C	12	34	3	460,902	373	81	12	35	3	461,625	355	77
D	4	----	0*	9,755****	117	-----	4	12	3	9,919****	150	-----
E	13	71	5	1,958,686	730	37	13	39	3	1,978,782	693	35
F	18	54	3	560,397	564	101	18	18	1	561,744	470	84
G	13	76	6	503,273	2464	490	13	13	1	510,882	390	76
H	26	27	1	1,312,935	825	63	26	27	1	1,312,467	940	72
I	20	45	2	723,674	502	69	20	41	2	722,795	536	74
J	2	12	6	273,793	189	69	2	12	6	273,861	194	71
K	18	18	1	548,731	413	75	18	18	1	547,716	395	72
L	6	208	35	768,453	3924	511	6	231	39	771,060	4068	528
M	27	45	2	1,243,412	1089	88	27	25	0***	1,242,973	94	8
N	33	66	2	884,838	623	70	33	66	2	882,640	599	68
O	16	45	3	231,849	481	207	16	42	3	232,497	439	189
P	8	38	5	1,066,128	582	55	0	0	0	0	0	0
Q	21	66	3	1,557,944	643	41	0	0	0	0	0	0
R	13	13	1	531,753	402	76	0	0	0	0	0	0
S	31	21	0**	1,104,552	411	37	0	0	0	0	0	0
T	0	0	0	0	0	0	3	3	1	411,587	146	35
U	0	0	0	0	0	0	13	85	7	1,527,914	1034	68
V	0	0	0	0	0	0	11	24	2	340,964	343	101

*The county or city didn't report the number of team.
** There were only 21 teams in the county's 31 villages and towns.
*** There were only 25 teams in the county's 27 villages and towns.
**** The county's manpower per 100,000 populations didn't count due to its less than 10,000 population.

In the counties and cities participated in 2009 (N = 18), 11,889 persons were established as community epidemic prevention manpower with an average of 660 persons (ranged 94 to 4,068). The average of manpower per 100,000 populations was 93 persons (ranged 7 to 528). Lienchiang County had 150 persons as manpower. Total 790 teams were set for community epidemic prevention manpower with an average of 44 teams (ranged 3 to 231); 17 counties and cities had at least one team in each of their villages, towns and districts, accounted for 94%, with an average of 18 persons per team.

2. Categories of counties and cities integrated volunteer groups

Number of category of counties and cities integrated volunteer groups ranged from 1 to 18.

3. Self-check results of community epidemic prevention manpower establishment and operation (see Table 2)

Self-check results in 25 counties and cities showed 99% implementation rate and 67% achievement rate. Among the achievements, the highest achievement was establishing connection and communication mechanisms of community volunteer groups (80%), and the lowest was planning to complete the operation of community volunteer groups (59%). The average achievement rate in participants (72.5%) was higher than the counties and cities not involved (25%). In addition, the achievement rate of planning to complete the operation and services of community volunteer groups in the counties and cities not involved was zero.

4. Local services

In performing community services, the most was providing public health education (96%) including respiratory hygiene, cough etiquette, time and steps of hand washing, followed by disease prevention advocacy (92%), distributing leaflets about prevention of pandemic influenza H1N1, environmental cleaning and disinfection (80%), community support and advocacy activities (72%), and local health authority assistance (68%) such as

Table 2. Self-check results of community epidemic prevention manpower establishment and operation in counties and cities

Self-check result / item	Accord A		Partial accord B		No implementation C		Implementation rate* (A+B/25)	Achievement rate (A/25)
	Program participation of counties and cities (N=25)							
	Y	N	Y	N	Y	N		
Integrating/establishing the list of community volunteer support network	17 (77%)	2 (67%)	5 (23%)	1 (33%)	0	0	100%	76%
Establishing connection and communication mechanisms of community volunteer groups	19 (86%)	1 (33%)	3 (14%)	2 (67%)	0	0	100%	80%
Planning to complete the operation of community volunteer groups	13 (59%)	0	9 (41%)	3 (100%)	0	0	100%	52%
Services of community volunteer groups	15 (68%)	0	6 (27%)	3 (100%)	1 (5%)	0	96%	60%
Total	64	3	23	9	1	0		
Average (rate)	72.7%	25%	26.1%	75%	1.2%	0	99%	67%

*implementation rate=No. of counties and cities accord and partial accord self-check/25*100%

telephone respects, taking body temperature and blood pressure, etc.

5.Operation of community epidemic prevention manpower

With regard to implementation results in 2-year period, local health bureaus in accordance with local resources and characteristics, held 1,126 drills (34,711 person-times) in communicable disease control education and practice for personnel, and 64 drills (921 person-times) in community prevention manpower mobilization, and also assisted 1,792 activities (146,021 person-times) in communicable disease control propaganda. Moreover, during floods by typhoons in some counties and cities, volunteers assisted to deliver eaflets and environmental disinfectant and demonstrated disinfectant making to households. When H1N1 influenza vaccination was expanded during H1N1 2009 pandemic, there were six counties and cities mobilized community prevention staff to assist inoculation, including maintaining the order, taking body temperature and vaccination promotion.

B. Attitude of program promotion

1.The participating length to the attitude of program promotion

Sixteen counties and cities participated in the program for consecutive two years; six involved for one year; three had not partaken. Cross-analysis results between participating length and the attitude of program promotion were shown in Table 3.

Table 3. Cross-analysis among participating years, integrated group number, and the attitude of program promotion

Attitude of program promotion versus participating years of counties and cities	One year		Two years		Contingency coefficient	P value
	No. of counties and cities	Proportion %	No. of counties and cities	Proportion %		
The helpfulness of the program in community pandemic prevention	(N=7)		(N=15)		0.350	0.215
Helpful	1	14	7	47		
passable	6	86	7	47		
Helpless	0	0	1	6		
The assent of program continuance	(N=7)		(N=15)		0.237	0.520
Assent	2	29	8	53		
No comment	4	57	5	33		
Dissent	1	14	2	14		
Confidence of community pandemic prevention with volunteers' assistance	(N=7)		(N=15)		0.3448	0.229
Confident (70% or more confidence)	0	0	2	13		
Passable (40%~60% confidence)	4	57	11	73		
Diffident (30% or less confidence)	3	43	2	14		
Attitude of program promotion versus integrated group number of counties and cities	1~2 volunteer groups		3 or more volunteer groups		Contingency coefficient	P value
The helpfulness of the program in community pandemic prevention	(N=10)		(N=12)		0..342	0.232
Helpful	2	20	6	50		
Passable	7	70	6	50		
Helpless	1	10	0	0		
The assent of program continuance	(N=10)		(N=12)			
Assent	3	30	5	42	0.415	0.102
No comment	4	40	7	58		
Dissent	3	30	0	0		
Confidence of community pandemic prevention with volunteers' assistance	(N=10)		(N=12)		0.529*	<0.05
Confident (70% or more confidence)	0	0	2	17		
Passable (40%~60% confidence)	5	50	10	83		
Diffident (30% or less confidence)	5	50	0	0		

Further analysis revealed that different participating length did not significantly correlate with the attitude of program promotion.

a.The helpfulness in community pandemic prevention

Among 22 participated counties and cities, 21 (95%) thought the program was helpful, the other one (5%) thought it was helpless. The proportion of helpfulness in counties participated for consecutive two years (44%) was higher than those involved for one year (17%).

b.The assent of program continuance

Among counties and cities subsumed in this program, 10 assented the program continuance (45%); 9 had no comment (41%); 3 dissent (14%). The proportion of assent in counties participated for consecutive two years (53%) was higher than those involved for one year (29%). The dissentient reasons for 3 counties were the authorities already had overall plan in response to influenza pandemic in their administrative areas, or thought the program was not feasible to implement. This difficulty indicated volunteers' service wills were incontrollable, and they viewed influenza as a high risk respiratory infectious disease, unlike other general business they used to assist.

c.Confidence of community pandemic prevention with volunteers' assistance

Seventeen counties and cities (77%) were confident, the other 5 (23%) were diffident. The proportion of 70% confidence in counties participated for two years (13%) was higher than those involved for one year (0%).

2.Integration of volunteer groups to the attitude of program promotion

Among participated counties and cities, 10 integrated 1 to 2 volunteer groups, and 12 integrated 3 or more volunteer groups. The proportion of negative attitude ranged 10% to 50% in the former 10 counties and cities, and 0 proportion of negative attitude in the latter 12. Cross-analysis results between volunteer groups integration and the attitude of program promotion were shown in Table 3. Further analysis revealed that counties and cities with more volunteer groups integration had stronger confidence in community pandemic prevention. Contingency coefficient reached 0.504 ($P < 0.05$) and showed significant correlation.

a.The helpfulness in community pandemic prevention

Among 22 participated counties and cities, 8 thought the program was helpful, 13 thought it was passable, and the other one thought it was helpless. The proportion of helpfulness was significantly different in counties integrated different volunteer groups. Counties integrated 1 to 2 volunteer groups accounted for 20%, those integrated 3 or more accounted for 50%.

b.The assent of program continuance

The assentient proportion of program continuance was very different as well. Counties integrated 1 to 2 volunteer groups accounted for 25%, those integrated 3 or more accounted for 62%.

c.Confidence of community pandemic prevention with volunteers' assistance

The confidence in counties integrated 3 or more volunteer groups (100%) was higher than those integrated 1 to 2 (58%).

C.The reasons of community epidemic prevention manpower loss

The reasons of manpower loss mostly related to human factors (63.8%) in which, mainly were difficulty finding time to participate (on job, being different volunteer, or with other affairs) and fear of infection (Table 4).

Discussion

A. Integration program promoted the completeness of constructing the community epidemic prevention network in counties and cities.

Non-profit organizations in each county flourished and various, such as the volunteer mother groups, community development or neighborhood watch groups, but none was mandatory and could not form a comprehensive community service. The villages' administrative system under the existing regulations also had limitations on current operation [2, 3]. Integration of community organizations and local service groups should be considered in order to immediately mobilize assistance to the implementation of epidemic control measures when outbreaks occurred. The counties and cities participated in the program for these two years have integrated their existing resources and established community volunteers support network and mobilizing mechanism. This evaluation found that counties and cities participated in the program planed more complete in community epidemic manpower. However, cultivation of community epidemic manpower won't happen overnight, a long-term run is necessary.

B. The participating duration enhance the attitude and confidence of program promotion.

Overall, more than 85% counties and cities thought the program was helpful and assented to continuous implementation. But less than 70% had confidence of community volunteers' assistance in pandemic. Though there were other factors could affect the

Table 4. The reasons of community epidemic prevention manpower loss

Reasons of loss	Number	Proportion, %
A. Human factors	**23**	**63.8**
Aging	3	8.3
Fear of infection	10	27.7
Difficult finding time to participate (on job, being different volunteer, or with other affairs)	9	25
Insufficient epidemic acknowledge and confidence	1	2.8
B. Funds and welfare	**6**	**16.7**
Inadequate funds or limited welfare	6	16.7
C. Environment	**5**	**13.9**
Difficult recruitment in aboriginal areas	1	2.8
Inconvenient transport in remote areas	3	8.3
Needs real jobs when economic recession	1	2.8
D. Others	**2**	**5.6**
High profession with low participation	1	2.8
Volunteers can not perform professional health education alone without conduct by medical personnel.	1	2.8
Total	36	100

confidence, analysis showed that counties participating in the program longer and with more volunteer groups' integration had higher confidence.

C. Volunteer services should be strengthened in epidemic prevention

Evaluation results showed that the integrated community prevention manpower mostly used to assist in personal health education and advocacy for epidemic control. The Implementation results in 2009 revealed that volunteers could help health units during immunization operations to maintain public order, take body temperature and propagate influenza vaccination, etc. In response to pandemic, counties and cities had set mobilization mechanism and formation. The focus of future should be continuously enhancing professional education and practice of community epidemic prevention to manpower.

D. To strengthen volunteers' profession could reduce the loss of volunteers.

This research found the important reason for volunteer loss came from human factors [4], while the important reason impacted the service wiliness was health threat [5-6]. Moreover, several researches indicated volunteers obtained knowledge and skills via education and training courses would further participate in care services and implement prevention ability [7]. The evaluation survey showed the main causes of epidemic prevention volunteer loss came from human factors. The major factor that affected their service will was fear of infection, followed by difficulty in time coordination. Although the counties and cities had conducted educations and trainings aiming at epidemic prevention volunteers, but too many goals in training content led the specialization couldn't go deeper, and insufficient familiarization of services reduced the service willingness.

E. Performance indicators should focus on measurement of communities' response capability

Implementation results from 2009 program demonstrated that performance indicators were focused on the number of volunteers, service times, training and meeting times, but lacking measurement indicators on communities' response capability in pandemic. To ensure communities' response capability in facing epidemic and protecting community public health, relevant quality indicators should be established.

Conclusions and recommendations

Based on existing health administration system, Taiwan CDC consigned counties and cities to integrate resources between public and private sectors and build a platform mechanism for operational coordination. Effective outcomes were occurred both upon establishment of epidemic prevention manpower networks and confidence of community manpower assisting the epidemic prevention work. This was also helpful to promote community epidemic prevention work so that should continue to promote the integration program of community volunteer.

Integration of community prevention manpower was beneficial to promote community epidemic prevention. Most research results indicated that resources of a single group were limited, while multi-sectional cooperation and resources integration performed great benefit in dealing with health risks [8-10]. When promoting community activities, one should encourage majority participants, including community residents and groups and not excluding any group. Analysis found the counties and cites integrated 3 or more volunteer groups had positive attitude to program promotion, and showed significant positive correlation of confidence. Therefore future plans contain strengthening "bonding" between original network members in each county and city, convert to implementing community prevention, earning agreement and "bridging" from other parallel governmental departments, and further to achieve "linking" combination of communities, local, and central. The capacity of integration in some counties and cities still improvable and should continue to integrate and make the best use of resources from governmental departments and various civil societies, so that more diverse networking can be involved in efforts for people's health.

Training courses designed for epidemic prevention manpower should be more focused on organization mobilizing, providing support, and self-protection. Professional training should be changed from quantify to quality requirements, and use single training goal to increase volunteers' learning efficiency and elevate their service will. Arranging time for volunteers to serve should be more flexible.

To establish the qualitative indicators of community capacity in response to influenza pandemic, it is necessary to use evaluative questionnaires and service benefit assessment for volunteer groups and community residents, and allow community epidemic prevention volunteers' ability better responding to the demands of future outbreaks.

References

1. Chang CC, Chou YM, Chou SM, et al. The comparison of influenza pandemic strategies, 2007-2008. Taiwan Epidemiol Bull 2006;24:908-15.
2. Li TS. The challenge and opportunity of cross-district governance--a case of community governance. Journal of Policing 2005;5:1-41.
3. Lan XP, Wu QE. View the practice of new public service: The status of community governance system in Taiwan. 2008 TASPAA collaborative partnership and ustainable development. Available at: http://web.thu.edu.tw/g96540022/www/taspaa/essay/taspaa2.htm
4. Hsu SC . A study on the management of community volunteereded social worker - take the Tzu-Chi volunteereded social worker as an example. Master paper of Graduate School of Social Informatics, Yuan Ze University 2005.
5. Yang SD. Construct the epidemic crisis mechanism system in public sector: example of epidemic management strategies and mechanisms in Taipei County. Community Development Quarterly 2003; 104: 45-56.

6. Gu YL, Lin WQ. Work record of SARS prevention and relative recommendations in Department of Social Welfare, Taipei City Government. Community Development Quarterly 2003; 104: 27-44. （in Chinese）
7. Yang JJ, Li IC, Hung DJ, et al. A survey on the needs and barriers related to community group participation in infectious disease prevention programs. Journal of Evidence-Based Nursing 2006;2:265-72.
8. Chernichovsky D, Leibowitz AA. Integrating public health and personal care in a reformed US health care system. Am J Public Health 2010;100(2):205-11.
9. Wen-Tang Cai. Study of Penghu County medical groups participate in community epidemic prevention. Master paper of Institute of Public Affairs Management, National Sun Yat-sen University 2007.
10. Chen SQ, Li YJ. Development of a community-based SARS preventive network model. The Journal of Nursing 2003; 50(44):23-8.