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Candidates were first recommended by the local public health bureaus and then visited by staff members from the National Quarantine Service. Around 600 volunteered to participate in this system and therefore became sentinel physicians [2].

By the end of December 2009, 800 sentinel physicians around the island, including 676 doctors from 633 clinics and the others from 71 hospitals, participated in this surveillance voluntarily (Table 1). Most of them were internists, pediatricians, family physicians, or otolaryngologists.

Table 1. Geographic distribution of sentinel physicians in Taiwan in 2009

Region	Locality	No. of townships	No. of townships with sentinel physicians	No. of sentinel physicians	No. of sentinel hospitals	No. of sentinel clinics	Township coverage rate (%)*
Taipei area	Taipei City	12	12	49	4	42	100.0
	Taipei County	29	19	68	1	58	65.5
	Keelung City	7	7	15	0	15	100.0
	Yilan County	12	11	26	3	23	91.7
	Kinmen County	6	3	4	0	4	50.0
	Lienchiang County	4	3	3	1	2	75.0
Northern Taiwan	Taoyuan County	13	13	46	6	35	100.0
	Hsinchu City	3	3	16	0	15	100.0
	Hsinchu County	13	12	25	1	20	92.3
	Miaoli County	18	14	22	2	18	77.8
Central Taiwan	Taichung City	8	8	28	1	27	100.0
	Taichung County	21	21	58	6	39	100.0
	Changhua County	26	26	50	3	42	100.0
	Nantou County	13	13	23	4	16	100.0
Southern Taiwan	Yunlin County	20	17	28	0	28	85.0
	Chiayi City	2	2	27	3	19	100.0
	Chiayi County	18	8	15	1	13	44.4
	Tainan City	6	6	19	2	17	100.0
	Tainan County	31	16	32	3	24	51.6
Kao-Ping Area	Kaohsiung City	11	11	49	6	39	100.0
	Kaohsiung County	27	27	51	6	40	100.0
	Pingtung County	33	33	50	4	41	100.0
	Penghu County	6	6	10	1	7	100.0
Eastern Taiwan	Hualien County	13	13	47	7	25	100.0
	Taitung County	16	16	39	6	24	100.0
T o t a l		368	320	800	71	633	87.0

* Township coverage rate: Number of townships with sentinel physicians / total number of townships *100%

Table 2. Diseases required to be reported in Sentinel Surveillance System—Taiwan, from 1990 to 2009

Years	Diseases required reporting
1990	measles, rubella, mumps, and varicella
1991, 1992	varicella, mumps, and bacterial gastroenteritis
1993, 1994	varicella, mumps, bacterial gastroenteritis, and pertussis
1995	measles, rubella, mumps, varicella, acute flaccid paralysis, and diarrhea
1996, 1997, 1998	measles, rubella, mumps, varicella, acute flaccid paralysis, diarrhea, and acute respiratory tract infections
1999	varicella, diarrhea, acute respiratory tract infections, influenza-like illness, and hand-and-foot-mouth disease or herpangina
2000, 2001	varicella, invasive gastroenteritis, non-invasive gastroenteritis, influenza-like illness, and hand-and-foot-mouth disease or herpangina
2002	varicella, diarrhea (before week 27, invasive gastroenteritis and non-invasive gastroenteritis were reported separately), influenza-like illness, and hand-and-foot-mouth disease or herpangina
2003, 2004	varicella, diarrhea, influenza-like illness, hand-and-foot-mouth disease or herpangina, and fever
2005, 2006	varicella, diarrhea, influenza-like illness, and hand-and-foot-mouth disease or herpangina
2007, 2008, 2009	diarrhea, influenza-like illness, and hand-and-foot-mouth disease or herpangina

The main targets of this surveillance system used to be four highly infectious diseases from the list of Reportable Communicable Diseases, including measles, rubella, mumps, and varicella. Adjustments on target diseases and definition of illnesses were made by experts annually according to the epidemics in that year. From 2007 to 2009, diseases required to be reported were influenza-like illness, enterovirus infections (including hand-foot-and-mouth disease and herpangina), and diarrhea. The diseases required to be reported over the years were listed in Table 2 [3]. Sentinel physicians were asked to report the total number of outpatients and the number of outpatient consultations for influenza-like illness, enterovirus infections (including hand-foot-and-mouth disease and herpangina), and diarrhea every week.

In 1999, National Quarantine Service, Bureau of Communicable Disease Control and National Institute of Preventive Medicine merged to form the Centers for Diseases Control (Taiwan CDC), which then took over the responsibility to operate this

surveillance system. To monitor epidemics on time, to fully grasp the severity of them, and to predict trends, Taiwan CDC collected and analyzed data from sentinel physicians as well as presented the results in statistical graphs and tables every week. Control measures were undertaken accordingly. The updated statistics were available on the official website of Taiwan CDC every Thursday for use and viewing by the CDC itself as well as the Department of Health, other health agencies, sentinel physicians and the general public [4]. Besides, a periodic publication named the Disease Investigation and Surveillance Communication (DISC) had been issued since 1995 to provide feedback to sentinel physicians' contributions and to publicize control measures against infectious diseases or public health strategies. This publication, renamed the Sentinel Surveillance Weekly Report on July 15, 2005, offered sentinel physicians the latest news and events regarding epidemics occurring abroad and in Taiwan [5]. Taiwan CDC also set up a toll-free phone consultation service for sentinel physicians. As

technologies progressed with each passing day, the Sentinel Surveillance System also changed over time. However, limited by the system architecture and the capacity of expansion, more powerful and more efficient data processing systems, such as Real-time Outbreak and Disease Surveillance (RODS), were built up. Because the Sentinel Surveillance System has already fulfilled its preset goal, it had been shut down by the end of 2009 with 20 years of meritorious accomplishments.

Comparison of Sentinel Surveillance Systems in Taiwan and other countries

To efficiently detect and monitor epidemics, most developed countries, such as the United States, Canada, Japan, Hong Kong, the United Kingdom, and France, have built up their own sentinel surveillance systems.

In the United States, the Outpatient Influenza-like Illness Surveillance Network (ILINet) was established in 1997 by the Centers for Disease Control and Prevention. Nearly 2,400 health care providers from all 50 states of America participated in this system. Physicians from about 1,300 sentinels provided weekly reports of the total number of outpatient consultations and the number of patients with influenza-like illness in the previous week. The accumulative number of outpatient consultations reached 1.6 million annually [6].

In Canada, the FluWatch was established in 1996 by Public Health Agency of Canada for early detection of influenza-like illness and flu outbreaks across the country. During the influenza season from 2005 to 2006, a total of 263 sentinel physicians, which averaged about

one sentinel physician for every 95,000 citizens, participated in this system. The frequency of reporting varied. During each influenza season, which goes from October in one year to May in the following year, sentinel physicians report weekly. During the non-influenza season, which goes from June to September every year, sentinel physicians are asked to report on a bi-weekly basis. The five indicators of this surveillance system (FluWatch) include the monitoring circulating strains of the flu virus in the central lab and sentinel labs, identification of viral subtypes and assessment of their sensitivity to antiviral medications, sentinel surveillance of influenza-like illness, gauge of the status of the flu epidemic, and flu-associated mortality in the pediatric department of hospitals [7-8].

In Japan, the Sentinel Surveillance System of Infectious Diseases was established in 1981 and was expanded to become the National Epidemiological Surveillance of Infectious Diseases in 1999 in response to a revision of the Communicable Diseases Control Act. In 2005, 4,729 health care providers participated in influenza surveillance, 3,065 pediatric sentinels participated in reporting 13 diseases, 649 ophthalmological sentinels participated in reporting 2 diseases, and 931 sentinels of sexually transmitted diseases participated in reporting 4 diseases. All of these sentinels were asked to report weekly, except for sexually transmitted diseases reported monthly. Besides, a total of 471 sentinel hospitals were divided into a weekly-report group and a monthly-report group; the former was asked to report 6 diseases and the later was asked to report 3 diseases [9].

In Hong Kong, the Physician Sentinel Programme was established by the Centre for Health Protection under the Department of Health in 1993 and became one part of the Sentinel Surveillance System. The system, operated through the support of a network of 64 general outpatient clinics and 41 doctors in the private practice, reports consultation rates of influenza-like illness, hand-and-foot-mouth diseases, acute conjunctivitis, and acute diarrheal diseases weekly [10].

In the United Kingdom, the Weekly Returns Service (WRS) was set up by the Research and Surveillance Centre of Royal College of General Practitioners in 1964. A total of 100 health care providers, including 500 sentinel physicians, were included, and 920,000 citizens, about 1.7% of total population, were covered in this system. Target diseases included influenza-like illness, respiratory diseases such as upper respiratory tract infections, acute bronchitis, the common cold, and other infectious diseases. Sentinel physicians were asked to report via a web-based system twice per week. The data were analyzed, summarized, and updated on the official website based on gender, age, and disease categories every week [11-13].

In France, Réseau Sentinelles was set up by professor Alain-Jacques Valleron in 1984 and managed by the Institut National de la santé et de la recherche médicale (INSERM) and U707 of the Department of Clinical Science at the University of Paris VI: Piéree et Marie Curie. The number of participating family physicians around the country in this surveillance was 1,260, about 2% of the total number of family physicians. Fourteen diseases, including 11 infectious diseases –

such as influenza-like illness, acute diarrhea, varicella, measles, and mumps – and 3 non-infectious diseases – such as asthma and suicide – require reporting. Sentinel physicians can report the data to a geographic information system (GIS) via the Internet. The analytic results of surveillance are updated on the website of Sentiweb-Hebdo every Tuesday and are e-mailed to more than 4,000 subscribers of that website. The operating center is also one of the collaborating institutes of the World Health Organization [14].

A comparison of sentinel surveillance systems in various countries, including Taiwan, results in a number of observations. First, the frequency of reporting varies. In Taiwan and most other countries, sentinels are asked to report weekly, but those in the United Kingdom are asked twice per week. The frequency of reporting in Canada is different from time to time, depending on whether it is the influenza season or not. Second, all sentinel physicians participate in surveillance voluntarily. The township coverage rate was as high as 87% in Taiwan, with 320 townships around the country being included. Third, target diseases in Taiwan were acute infectious diseases, such as influenza-like illness, hand-and-foot-mouth disease or herpangina, and diarrhea, while Japan, France, and some other countries also monitor non-infectious diseases. Last but not least, sentinel physicians in most countries use a web-based system to report, while only 13.9% (i.e. 98 health care providers) in Taiwan report via the Internet. This could be attributed to some human factors such as the fear of computer virus or hackers and the lack of efficacy in using computers.

Inadequate software or hardware also contributed.

Contributions of Sentinel Surveillance System in Taiwan

In addition to providing routinely-updated data of surveillance, the Sentinel Surveillance System also greatly contributed to the detection and monitoring of important epidemics in recent years, especially the enterovirus outbreaks. From April to June, 1997, an outbreak of Enterovirus 71 leading to quite a few deaths occurred in Sarawak, Malaysia [15]. Hand-foot-mouth disease and herpangina were therefore included in the target diseases of the Sentinel Surveillance System. The system had detected an unusual increase in the number of patients with hand-foot-mouth disease or herpangina in March 1998, one month before several outbreaks occurred in April. The number of cases peaked in July. Because of early detection, subsequent control measures were able to efficiently contain the disease and prevent its spreading [16-17].

In our Sentinel Surveillance System, clinical practitioners offered first-hand data and reported on a regular basis. Analysts set up databases accordingly. Through collection and analysis of data, they aimed to detect infectious disease outbreaks earlier, to offer timely alarms, and to contain the disease from spreading. Besides, in order to formulate control measures against infectious diseases, to predict the trends in the future, and to prevent the occurrence of emerging infectious diseases, they also compared and analyzed data from successive years. The sentinel coverage rate of Taiwan was one sentinel clinic for every

43,000 citizens, which was better than that of the United States, Canada, and Hong Kong, and was only second to that of Japan (about one sentinel for every 27,000 citizens) [2]. In Taiwan CDC, we hold weekly conferences discussing local epidemics based on data collected from different surveillance systems, including the Sentinel Surveillance System and the Real-time Outbreak and Disease Surveillance (RODS). Data from both systems were analyzed and compared, and the results were highly consistent. Because data from the RODS was timelier, the termination of the Sentinel Surveillance System was considered.

Challenges

The sentinel physicians could report via the Internet, fax, or phone. If physicians chose to use a web-based reporting system, they had to login and type in the clinical information themselves. If they chose to report via fax or phone, staff of Taiwan CDC would type in the information for them. Of the 704 health care providers, only 98 reported via the Internet, and the remaining 606 chose to use either fax (442) or phone (164) to report. The process of reporting was time-consuming. Although experts were invited to adjust the target diseases and definition of illnesses annually according to the epidemics in that year, the diagnosis of individual cases still depended on sentinel physicians' expertise. A case could be reported with more than one diagnosis according to the physician's personal judgments. Besides, the rapid growth of the domestic health care industry in recent years and the addition of many local clinics set up in the countryside had resulted in a shifting balance in outpatient consultations between

urban and rural areas. The representativeness of health care providers involved in this system became questionable and required frequent reviews and adjustments.

As technologies progressed with each passing day, the Sentinel Surveillance System also changed over time. Combined with the geographic information system and electronic maps, and thanks to the rapid progress of technologies in internet transmission, disease surveillance was no longer a text-based activity. Timeliness is a key goal when it comes to establishing a new surveillance system. For example, Taiwan CDC and the University of Pittsburgh cooperated to develop the Real-time Outbreak and Disease Surveillance (RODS). The diagnostic information of emergent consultations from the more than 150 health care providers in our National Health Insurance System was spontaneously and instantaneously transmitted to Taiwan CDC. Currently, information regarding influenza-like illness, enterovirus infections, diarrhea, and acute conjunctivitis were routinely reported and could be used in analyses and to detect any changes or abnormalities. With the permission from the Bureau of National Health Insurance, Taiwan CDC also started obtaining information of outpatient consultations for influenza-like illness, hand-foot-mouth disease, herpangina and diarrhea from the National Health Insurance System everyday. Consequently, the importance of the Sentinel Surveillance System had decreased gradually.

Conclusion

In Taiwan, the establishment of the web-based National Notifiable Disease

Reporting System started in 1993. In 1997, we set up a trial Sentinel Surveillance Reporting System, the forerunner of web-based surveillance system. In which, online real-time statistical analysis was used, which not only helped strengthen the willingness of sentinel physicians to report cases but also served to publicize control measures and strategies. The Sentinel Surveillance System had played an important role in monitoring major outbreaks in recent years. However, considering its limitations such as the time-consuming reporting process and the questionable representativeness of the system, the Sentinel Surveillance System could no longer fulfill our needs and had been shut down by the end of 2009. Although newer, more advanced, and more accurate systems, such as the RODS and medical records from the Bureau of National Health Insurance, have replaced the Sentinel Surveillance System, the meritorious accomplishments of the Sentinel Surveillance System deserve an acknowledgement.

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Cognitive Differences in Infectious Disease Prevention and Status of Immunization of Vietnamese Spouses in Taiwan

Yu-chen Hsu¹, Kun-yu Tsai²,
Chin-shui Shih¹, Ying-hwei Chen¹

1. First Division, Centers for Disease Control, Taiwan
2. Second Division, Centers for Disease Control, Taiwan

Abstract

The purpose of this study is to investigate the cognitive difference in dengue fever (DF) and avian flu (AF) prevention of Vietnamese spouses before and after arriving in Taiwan; and their status of immunization as a reference

for planning policies on infectious disease prevention for foreign spouses in Taiwan. A survey was conducted on Vietnamese spouses living in Taiwan (Vietnamese spouses) and Vietnamese brides (Vietnamese brides), from September to October 2007, through local health bureaus and ROC representative office in Vietnam. Of 4,406 valid copies, 3,906 copies were recovered from Vietnamese spouses and 500 copies from Vietnamese brides. Results of multiple regression analysis show that the average score of the cognition in DF prevention of Vietnamese spouses is higher than that of the Vietnamese brides by a score of 0.4, and the difference is statistically significant ($p < 0.001$). By contrast, the average score of the cognition in AF prevention of Vietnamese brides is higher than that of the Vietnamese spouses by 0.3, and the difference is statistically significant ($p < 0.002$). Also, the vaccination rate of Vietnamese brides is higher than that of Vietnamese spouses (57.7% versus 30.1%, $p < 0.001$). The longer stay in Taiwan, the stronger the cognition in DF prevention, though the cognition in AF prevention of those coming to Taiwan is higher. The Vietnamese spouses in Taiwan have less knowledge in DF symptoms and preventive measures, but both groups lack knowledge in AF preventive measures. Though the MMR, measles and JE vaccination rate of Vietnamese spouses tends to increase, it is still relatively lower.

Keywords: foreign spouse, Vietnamese spouse, Vietnamese bride, dengue fever (DF), avian flu (AF)

Introduction

Vietnam is a developing country with

substandard hygiene, making infectious diseases a main hazard to the health of locals. Major infectious diseases in Vietnam include AIDS, dysentery, TB, and dengue fever [1,2]. WHO data showed [3] that there were 110 confirmed H5N1 cases, including 55 deaths, in Vietnam from 2003 to April 2009, just second to Indonesia. Also, Taiwan CDC statistics, by 24 April 2009, showed that 31 out of 116 imported infectious disease cases were from Vietnam, ranking it the second highest. Most were DF cases, ranking first of the top five DF source countries [4].

Marriage between Taiwanese males and foreigners or Chinese females has become increasingly popular in the past decade. Excluding Chinese brides who have little linguistic and cultural differences to people in Taiwan, Vietnamese brides are the most popular choice for Taiwanese males [5]. Statistics of the National Immigration Agency (NIA) by 31 March 2009 [6] showed that the total of non-Taiwanese spouses is 417,083 persons, including 81,276 Vietnamese spouses (19.49%), which is the second highest just second to Chinese spouses (63.56%). In terms of average age, the 2003 marital statistics of the Ministry of the Interior [7] showed that Southeast Asian brides (23.6 years) are younger than Taiwanese brides (28.3 years). In terms of education, Southeast Asian brides (26.1% graduated from senior high schools or schools of higher levels) are lower than Taiwanese brides (79.9% are graduated from senior high schools or schools of higher levels).

The marriage between Taiwanese males and Vietnamese brides continues to increase [6]. As Vietnamese brides are unfamiliar with

the language, lifestyle, custom, culture and social environment of Taiwan, and they are younger and have lower education, their social and financial status in the husband's family is comparatively lower. As they usually have babies immediately after marrying to Taiwanese, the social problems arising from Vietnamese spouses and their children begin to gain social attention, and solutions are thus planned [8]. Although there are many medical-related studies on foreign spouses or foreign brides in Taiwan, most emphasize the medical needs and psychological problems of foreign spouses and healthcare for their children [9], and none of these studies addresses issues related to infectious diseases.

This study investigated the cognitive differences in DF and AF of Vietnamese spouses before and after arriving in Taiwan and their vaccination status in order to provide a reference for Taiwan to plan the policy on infectious disease prevention for foreign spouses.

Materials and Methods

Samples of this study were selected from two sources, Vietnamese spouses and Vietnamese brides. From 420,948 non-Taiwanese spouses retrieved from the NIA statistics by mid-December 2006, 90,805 Vietnamese were selected. After comparing with the National Immunization Information System (NIIS) of Taiwan CDC, 84,273 Vietnamese spouses currently residing in Taiwan became the population of the Vietnamese spouses. After classifying the population by household registration address and the number of Vietnamese spouses in the population of local counties and cities, the

estimated returns of questionnaires are at least 1,500 copies. Also, the population of Vietnamese brides was estimated according to the NIA statistics by December 2006. As every year there are 3,000 new Vietnamese brides on average, the estimated new Vietnamese brides are about 250 a month, and the estimated returns of questionnaire are 500 copies.

Data of this study were collected from two sources, Vietnamese spouses and Vietnamese brides. A total of 15,000 copies of questionnaire were distributed through 25 local health bureaus to their health centers with the list sorted by household registration data retrieved from the database. The questionnaire was distributed to and answered by Vietnamese spouses when they took their infants to receive vaccination or participated in the health education activities at the health center, or during the home visit of community health nurses. A total of 600 copies of questionnaires for Vietnamese brides were distributed to Vietnamese brides who have obtained a visa to Taiwan through the Taipei Economic and Cultural Office in Vietnam and its Ho Chi Minh City Office during the Life in Taiwan Adjustment Course for Vietnamese Brides organized on a weekly basis. The survey time of both groups was September to October 2007. Of 4,406 valid copies, 3,906 were responded from Vietnamese spouses and 500 copies from Vietnamese brides.

The questionnaire is divided into two parts. Part I is about the basic data of respondents, including age, education, Chinese proficiency, information sources of infectious diseases, and vaccination status. Part II containing 20 items on the knowledge in DF and AF prevention, and 10 items for each

disease, including DF symptoms (2 items), mode of DF infection (4 items), and DF prevention methods (4 items); and AF symptoms (1 item), mode of AF infection (4 items), and AF prevention methods (5 items). The questionnaire was designed in Chinese and translated into Vietnamese by Vietnamese translators. A pretest was conducted on 5 Vietnamese caregivers and 5 Vietnamese spouses to validate the contents of the Vietnamese version.

The questionnaire data were filed using Microsoft Excel. The score for each item in Part II is 1 for a correct answer and 0 for a wrong answer. The total scores for all items in each of the DF and AF sections is 10. Data were analyzed with the SAS 9.1.3 statistic software to respectively describe the characteristics of age, education and Chinese proficiency, information sources of infectious diseases, and vaccination status of Vietnamese spouses and Vietnamese brides. The Chi square test (χ^2 test) was applied to compare the differences between both groups. The box plot was applied to analyze the score distribution of cognitive differences in infectious diseases between both groups. The difference between the mean and median of both groups was examined with the t-test and Wilcoxon Rank Sum test. The multiple linear regression model was applied to further analyze the correlations between whether stay in Taiwan, length of stay in Taiwan and cognition of DF and AF prevention. The model includes the following variables, age, education, Chinese proficiency, information sources of the infectious diseases in Taiwan or Vietnam, information sources of the infectious diseases in Taiwan before coming to Taiwan, and vaccination status.

Results of this one-factor analysis show the correlations between whether stay in Taiwan and the score of infectious disease cognition are statistically significant. Therefore, they were included in the regression model to control their effects. The length of stay in Taiwan falls into 1981-2001, 2002-2003, 2004, 2005-2007, and 2008-2010, equivalent to the quintile of the distribution, whereas 2008-2010 refers to the estimated time in Taiwan. The vaccination status of both groups was also analyzed.

Results

The basic data distribution of both groups is tabulated in Table 1. Vietnamese spouses are older, including 66.9% aged 26-30 or older, and most Vietnamese brides are aged under 25 (54.7%). However, the education of Vietnamese brides is higher, with 40.7% graduated from senior high schools or schools of higher levels, which is higher than the 31.1% in Vietnamese spouses. Though the Chinese proficiency of both groups is similar, and most of the respondents understand and speak Mandarin (53.3% versus 57.4%), more Vietnamese spouses (29.8%) can read Chinese. Though Figure 1 shows that cognitive difference in DF and AF prevention between both groups is small, it is statistically significant. At present, Vietnamese spouses have slightly stronger cognition of DF prevention but weaker in AF prevention. Though the average score of the cognition in DF prevention of Vietnamese spouses is higher than that of Vietnamese brides by only 0.4, the difference is statistically significant ($p < 0.001$). Also, though the cognition in AF prevention of Vietnamese brides is higher than that of

Table 1. Selected characteristics of Vietnamese spouses and Vietnamese brides

Characteristic	Vietnamese Spouses (n=3906)		Vietnamese Brides (n=500)		P-value*
	Number	Percentage	Number	Percentage	
Age					<0.001
Under 25	1254	33.1	263	54.7	
26-30	1539	40.7	115	23.9	
31 and older	993	26.2	103	21.4	
Miss value (n=139)					
Education					<0.001
Grade 5 of lower	1044	27.74	89	18.2	
Grade 9 (junior high school)	1551	41.22	202	41.2	
Grade 12 (senior high school or higher levels)	1168	31.0	199	40.6	
Missing value (n=153)					
Chinese proficiency					<0.001
Do no understand at all	280	7.4	68	13.7	
Understand some but cannot speak	362	9.5	41	8.2	
Understand and speak	2030	53.3	286	57.4	
Understand, speak and read	1136	29.8	103	20.7	
Missing value (n=100)					

*P-value is obtained from Chi-square test (χ^2 test)

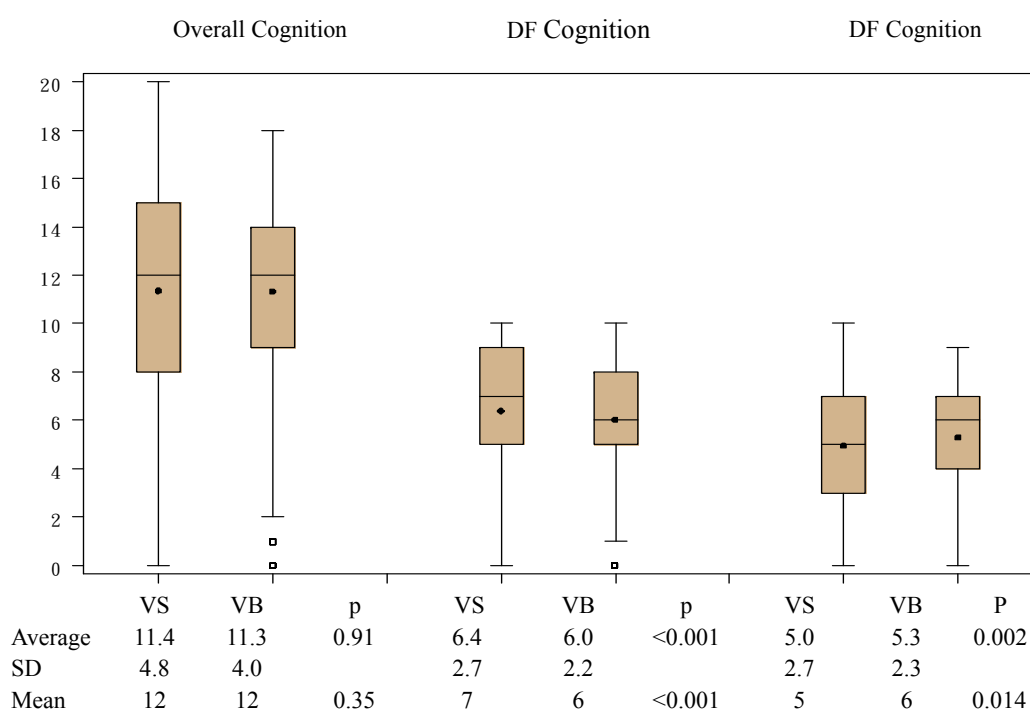


Figure 1 Score of infectious disease cognition of Vietnamese spouses and Vietnamese brides

Vietnamese spouses by only 0.3, the difference is statistically significant ($p=0.002$). In information sources of infectious diseases, TV, health authorities, and schools (Table 2) are the major sources for Vietnamese spouses; and TV, health authorities, newspapers, radio, schools or the Internet are those for Vietnamese brides.

Table 3 shows the results of the multiple regression analysis on the correlations between whether stay in Taiwan, and length of stay, to the score of infectious disease cognition. After age adjusted, education and Chinese proficiency, information sources of infectious diseases in Taiwan or Vietnam, information sources of the infectious diseases in Taiwan

Table 2. Information sources of infectious diseases of Vietnamese spouses and Vietnamese brides (multiple answers)

Item	Vietnamese spouses (n=3906)		Vietnamese brides (n=500)		P-value*
	Number	Percentage	Number	Percentage	
Information sources of infectious diseases in Taiwan or in Vietnam					
Medical institutions	623	16.0	97	19.4	0.05
Health authorities	1077	27.6	229	45.8	<0.001
School	824	21.1	137	27.4	0.001
TV	1657	42.4	258	51.6	<0.001
Radio	733	18.8	195	39.0	<0.001
The Internet	577	14.8	172	34.4	<0.001
Newspapers	221	5.7	102	20.4	<0.001
Advertising signboards	136	3.5	64	12.8	<0.001
Publicity leaflets	199	5.1	84	16.8	<0.001
Other	115	2.9	21	4.2	0.13
None	530	13.6	17	3.4	<0.001
Information sources of the infectious diseases in Taiwan before coming to Taiwan					
Taipei Economic and Cultural Office in Vietnam and its Ho Chi Minh City Office	461	11.8	164	32.8	<0.001
Hospitals	720	18.4	121	24.2	0.002
Friends and relatives in Taiwan	768	19.7	113	22.6	0.12
TV	1537	39.4	120	24.1	<0.001
Radio	442	11.3	82	16.4	<0.001
Newspapers and magazines	334	8.6	61	12.1	0.007
The Internet	181	4.6	41	8.2	<0.001
Publicity leaflets at Taiwan International Airport	126	3.2	26	5.2	0.023
None	728	18.6	29	5.8	<0.001

*P-value is obtained from Chi-square test (χ^2 test)

Table 3. Regression analysis of correlations between stay in Taiwan and length of stay and score in cognition (n=4,406)

	DF Cognition			AF Cognition		
	Coefficient	SE	p	Coefficient	SE	p
Model 1: Stay in Taiwan (Yes Vs No)	0.22	0.13	0.089	-0.44	0.14	0.001
Model 2: Length of Stay (Vs 1981-2001)						
2002-2003	-0.22	0.12	0.065	-0.16	0.12	0.19
2004	-0.05	0.14	0.69	-0.19	0.15	0.20
2005-2007	-0.52	0.12	<0.001	-0.20	0.13	0.12
2008-2010	-0.44	0.14	0.001	0.21	0.15	0.14

before coming to Taiwan, and vaccination status are compared, Model 1 shows that the cognition of DF prevention in Vietnamese spouses is unrelated to whether stay in Taiwan; while their cognition in AF prevention is lower than that of Vietnamese brides by 0.44 ($p=0.001$), and the difference is statistically significant. Model 2 analyzing the correlations between the length of stay in Taiwan and infectious disease cognition shows that when compared to Vietnamese spouses coming to Taiwan before 2001, the score of the cognition in DF prevention of those coming to Taiwan in 2001-2004 is slightly lower but statistically insignificant. However, the difference from those coming to Taiwan after 2005 is significant, and the score of the cognition in

DF prevention of those coming to Taiwan in 2005-2007 and those planning to come to Taiwan after 2008 is lower by 0.52 ($p<0.001$) and 0.44 ($p=0.001$) respectively. The correlation between the cognition in AF prevention and length of stay in Taiwan is insignificant. However, when compared to those coming to Taiwan before 2001, the score of the cognition in AF prevention of those coming to Taiwan in other years is slightly lower, except for those planning to come to Taiwan.

Results of comparing the vaccination status of both groups show that the vaccination rate of Vietnamese spouses is much lower than that of Vietnamese brides (30.1% Vs 57.7%) as shown in Table 4. A larger difference is found

Table 4. Vaccination status of Vietnamese spouses and Vietnamese brides

Item	Vietnamese spouses (n=3906)		Vietnamese brides (n=500)		P-value*
	Number	Percentage	Number	Percentage	
Vaccination in Vietnam					<0.001
Yes	1111	30.1	265	57.7	
No	524	14.2	33	7.2	
Do not remember	2054	55.7	161	35.1	
Vaccination in Vietnam by item					
Hepatitis B Vaccine	472	12.1	123	24.7	<0.001
BCG	397	10.2	82	16.4	<0.001
DPT	411	10.5	64	12.8	0.12
OPV	514	13.2	64	12.8	0.82
Varicella Vaccine	317	8.1	63	12.6	<0.001
MMR	299	7.7	70	14.0	<0.001
Measles Vaccine	205	5.3	57	11.4	<0.001
JE Vaccine	256	6.6	61	12.2	<0.001
Typhoid Vaccine	169	4.3	33	6.6	0.022
Influenza Vaccine	154	3.9	26	5.2	0.18
None of the above	524	13.4	33	6.6	<0.001
Do not remember	2054	52.6	161	32.3	<0.001
Vaccination in Taiwan					
Yes	1325	36.8			
No	1028	28.6			
Do not remember	1248	34.7			
Vaccination in Taiwan by item					
Hepatitis B Vaccine	174	4.5			
DPT	129	3.3			
Varicella Vaccine	168	4.3			
MMR	941	24.1			
Influenza Vaccine	227	5.8			
None of the above	1028	26.3			
Do not remember	1248	32.0			

*P-value is obtained from Chi-square test (χ^2 test)

in the vaccination for HBV, BCG and MMR. The increase in the vaccination rate of Vietnamese spouses is limited, only 6.7%, and mostly the MMR vaccine.

Discussion

Results of the survey on information sources of infectious disease prevention show that TV, health authorities, and publicity leaflets are the major sources of infectious disease prevention for both Vietnamese spouses and Vietnamese brides. This suggests that these three channels are familiar to Vietnamese spouses and the easiest ways for them to obtain information; and coincides with the results of the DF prevention survey conducted by Taiwan CDC in 2008 [10]. Taiwanese people hope that the government can educate and publicize DF prevention through TV, home visits, and publicity leaflets and booklets. Therefore, the government is recommended to continue health education for the public through these channels. Also, results show that over 50% of either Vietnamese spouses or Vietnamese brides understand Mandarin, though only 20-30% read Chinese. Therefore, the government is recommended to prepare a Vietnamese version or an illustrated version with simple Chinese characters when designing publicity leaflets.

Results of the cognition in infectious disease prevention show that the average score of the cognition in DF prevention of Vietnamese spouses is higher than that of the Vietnamese brides; though the average score of the cognition in AF prevention of Vietnamese brides is higher than that of the Vietnamese spouses by 0.3. After age adjusted, education and Chinese proficiency, information sources

of infectious disease prevention, and vaccination status, the cognition in AF prevention of Vietnamese spouses is slightly lower than that of the Vietnamese brides by 0.44, and the difference is statistically significant ($p=0.001$). These results suggest that Vietnamese spouses are more familiar with DF prevention but less familiar with AF prevention. In addition, the results also illustrate that Vietnamese spouses have less knowledge in DF symptoms and DF preventive measures as well as AF preventive measures. Thus, we recommend that health authorities should pay attention to those issues when developing a health education program for Vietnamese spouses. This also coincides with the public cognition in DF and AF prevention in Taiwan. Results of the survey on DF prevention conducted by Taiwan CDC in 2006 [11] showed that 95.4% of the respondents know the mode of DF infection, and 96.1% of the respondents are willing to cooperate with the health authorities in spraying pesticide and to remove the reservoirs. A survey on AF prevention conducted in 2008 [12] showed that though 83% of the respondents have heard of the avian flu, the percentage of cognition in self-protection measures is comparatively low, and 24% of the respondents do not know how to prevent AF.

After age adjusted, education and Chinese proficiency, information sources of infectious disease prevention, and vaccination status, the cognition in DF prevention of Vietnamese brides is unrelated to whether stay in Taiwan. By dividing the period of coming to Taiwan into 5 time segments, we discovered that the score of the cognition in DF prevention of Vietnamese spouses coming to Taiwan before

2001 is higher than those coming to Taiwan after 2001. Also, the score of the cognition in DF prevention of Vietnamese spouses coming to Taiwan later is lower. This suggests that the longer stay of Vietnamese spouses in Taiwan, the better they adjust to the Taiwanese society, and the more they are familiar with the information sources and channels of infectious disease prevention. Therefore, Taiwan health authorities should collaborate with overseas Taiwan representative offices to strengthen the cognition in infectious disease prevention of Vietnamese brides by adding courses related to infectious disease prevention to the weekly Life in Taiwan Adjustment Course for Vietnamese Brides in order to maintain their personal health and the health of the next generation.

An important issue discovered in this study is that the vaccination rate of Vietnamese spouses is lower than that of Vietnamese brides. This indicates that the policy implemented since December 1, 2006, to request aliens to submit health certification of the required physical examinations; and females aged between 15 and 50 (either married or single) to submit a positive report of Rubella antibody or certification of Rubella vaccination when applying for residence or permanent residence in Taiwan [13] has effectively enhanced the vaccination rate. It also shows that new immigrants have paid more attention to vaccination, or the Vietnamese disease prevention policy has improved. However, further studies on the adequacy of disease prevention measures for Vietnamese spouses in Taiwan should be conducted.

This study adopted a cross-sectional research design. Though researchers attempted

to ensure the accuracy, integrity and validity of data collected, there are some limitations on the research. In sample selection, samples for Vietnamese spouses were selected with convenience sampling due to the limits on time and labor. The questionnaire was answered by Vietnamese spouses either during home visit by community nurses or voluntarily when they received vaccination or participated in the health education courses at local health centers over a two-month period. As these samples have contacted with health center personnel regularly, this suggests that they have more opportunities to access information about infectious disease prevention than Vietnamese brides. If it is the case, the vaccination rate of Vietnamese spouses without contact with either health center nurses or health centers will be lower. Samples from Vietnamese brides answered the questionnaire when they participated in the Life in Taiwan Adjustment Course for Vietnamese Brides organized by the local Taiwan representative office. They are Vietnamese brides who obtained the Taiwan visa during September-October 2007. Additionally, as it should not take respondents long to answer the questionnaire, items were designed only for the two major infectious diseases, DF and AF, most focused in Taiwan and Vietnam in recent years. Other infectious diseases, such as AIDS, TB and intestinal parasites, which are required in the health examination items, were not included in the survey. Also, as the survey did not investigate the cognition in infectious disease prevention of women in Taiwan, it is unable to assess the cognitive difference in infectious disease prevention between Vietnamese and local women. These issues will be investigated in

further studies.

This study is the first survey in Taiwan to investigate the cognition in infectious disease prevention of Vietnamese spouses. Results show that TV, health authorities, and publicity leaflets are the major information sources of infectious disease prevention for Vietnamese spouses. Although the score of the cognition in infectious disease prevention of Vietnamese spouses is unrelated to whether stay in Taiwan, the length of stay is correlated to the score of the cognition in infectious disease prevention. Furthermore, the longer the stay is, the higher the score. Also, when compared with the vaccination status of Vietnamese spouses before coming to Taiwan, though the MMR, measles, and JE vaccination rate of Vietnamese brides tends to increase, it is still comparatively low. Therefore, when promoting health education through TV and interpersonal communication of health center personnel, the government can also consider publicity leaflets. However, a Vietnamese version or illustrated version with simple Chinese elaboration should be prepared. Also, collaboration with Taiwan representative offices by adding courses related to infectious disease prevention to cultural adjustment courses is recommended to strengthen the cognition in infectious disease prevention for Vietnamese and other foreign brides in order to maintain personal health and the health of the next generation.

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