

Analysis of Antivenin Usage in Taiwan from National Health Insurance Research Database, 2008–2012

Chien-Hsin Liu^{*}, Wen-Chin Hsieh

Abstract

Taiwan is located in subtropical region, currently identified 23 species of snakes, among them 6 venomous ones are medically important. These are *Protobothrops mucrosquamatus*, *Viridovipera stejnegeri*, *Deinagkistrodon acutus*, *Naja atra*, *Bungarus multicinctus*, and *Daboia russellii*. Presently, the only therapeutic treatment for venomous snakebites is to administer specific type of antivenin. In Taiwan, the antivenins are only produced by the Center for Research, Diagnostics and Vaccine Development at Taiwan Centers for Disease Control. This study aims to analyze the database from national health insurance in order to understand the usage of antivenin in Taiwan from 2008–2012.

The results showed that, on average, 1,202 patients applied for antivenin each year. Annually, the average number of person uses of lyophilized antivenin of *Tr. mucrosquamatus* and *Tr. gramineus* (FH) was 998 patients, followed by antivenin of *B. multicinctus* and *N. atra* (FN), 286 patients; antivenin of *D. acutus* (FA), 16 patients; and antivenin of *D. russellii* (FR), less than 3 patients. In terms of usage, annual amount of FH was 2,736 vials; FN, 1,006 vials; FA, 36 vials; and FR, 7 vials.

The amount of antivenin used by outpatients or hospitalized patients in Taiwan was, in descending sequence, FH, FN, FA and FR respectively. Analysis of the clinical usage of antivenin provides us references for the production of the antivenins.

Keywords: Snake-bite, National health insurance data, Antivenin

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Survey of Snakebite by *Protobothrops mucrosquamatus* and *Viridovipera stejnegeri*, Taiwan, 2008

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Abstract

Both *Protobothrops mucrosquamatus* and *Viridovipera stejnegeri* are the major hemorrhagic, venomous snake species in Taiwan. The number of bitten cases by them were also higher than those bitten by the other 4 venomous snakes in Taiwan. This study attempts to assess the epidemiology of snakebite cases caused by *P. mucrosquamatus* and *V. stejnegeri* in Taiwan, annual antivenom dosage consumption, the side effects after administration of antivenom, and prognosis. The questionnaires for snakebite cases seeking medical care in 2008 were collected from medical centers and district hospitals. Among 78 cases, 36 were bitten by *P. mucrosquamatus*, and 42 bitten by *V. stejnegeri*. Twenty-two (28%) cases aged 51–60 years were mostly affected. The most often bitten site was extremities, especially the upper-limbs (including palms) with 43 (55%) cases, followed by the lower-limbs (including soles) with 32 (41%) cases. Among all patients, 74% of them can be delivered to hospital within one hour for medical treatment, and 43 (55%) bitten cases were hospitalized. The average duration of hospitalization was 3.98 days. The total antivenom consumption were 282 doses, 28 (36%) cases received one dose. One case bitten by *P. mucrosquamatus* received 17 doses. The rate of side effects was 8%, and no serious adverse event was observed. This study showed that the antivenom manufactured by Taiwan Centers for Disease Control provides safe and effective treatment for patients bitten by *P. mucrosquamatus* and *V. stejnegeri*.

Keywords: Antivenom, Epidemiology, Snakebite

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Weekly Data of Notifiable Infectious Diseases (by week of diagnosis)

Case diagnosis week		Week 16		Week 1–16	
Classification	Disease Diagnosed	2017	2016	2017	2016
Category I	Plague	0	0	0	0
	Rabies	0	0	0	0
	SARS	0	0	0	0
	Smallpox	0	0	0	0
Category II	Acute Flaccid Paralysis	0	4	13	13
	Acute Viral Hepatitis type A	7	10	219	199
	Amoebiasis	7	2	111	78
	Anthrax	0	0	0	0
	Chikungunya Fever	0	1	5	4
	Cholera	0	0	0	0
	Dengue Fever	3	9	75	524
	Diphtheria	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0
	Epidemic Typhus Fever	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	1	1	3
	Malaria	0	0	0	4
	Measles	0	1	5	2
	Meningococcal Meningitis	0	0	5	2
	Paratyphoid Fever	0	0	3	0
	Poliomyelitis	0	0	0	0
	Rubella	0	1	0	4
	Shigellosis	6	7	67	68
Typhoid fever	1	0	8	1	
West Nile Fever	0	0	0	0	
Category III	Acute Viral Hepatitis type B	2	1	52	26
	Acute Viral Hepatitis type C ⁴	3	6	73	58
	Acute Viral Hepatitis type D	0	0	1	1
	Acute Viral Hepatitis type E	0	2	7	6
	Acute Viral Hepatitis untype	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	1	3
	Haemophilus Influenza type b Infection	0	1	2	3
	Japanese Encephalitis	0	0	0	0
	Legionellosis	2	3	34	34
	Mumps	14	9	192	164
	Neonatal Tetanus	0	0	0	0
	Pertussis	1	1	8	3
	Tetanus	1	0	3	2
	Category IV	Botulism	0	0	0
Brucellosis		0	0	0	0
Complicated Influenza		9	17	176	1792
Complicated Varicella		0	0	6	13
Endemic Typhus Fever		1	0	7	3
Herpesvirus B Infection		0	0	0	0
Invasive Pneumococcal Disease		4	11	189	254
Leptospirosis		0	1	24	13
Lyme Disease		0	0	0	0
Melioidosis		0	1	7	5
Q Fever		0	1	4	9
Scrub Typhus		0	2	93	72
Toxoplasmosis		0	0	6	5
Tularremia		0	0	0	0
Category V	Ebola Virus Disease	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0
	Novel Influenza A Virus Infections	0	0	1	0
	Lassa Fever	0	0	0	0
	Rift Valley Fever	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0
	Yellow Fever	0	0	0	0
	Zika Virus Infection	0	0	1	1

1. The numbers of new cases and cumulative cases of notifiable infectious diseases include indigenous and imported cases.
2. The following 8 chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.
3. Reported cases.
4. Since 2016/1/22, "Zika Virus Infection" was listed as a Notifiable Infectious Disease.

Suspected Clusters

- Thirty-five clusters were reported, including 5 tuberculosis clusters, 14 diarrhea clusters, 7 upper respiratory tract infection clusters, 8 influenza-like illness clusters and 1 fever of unknown origin cluster.

Imported Infectious Diseases

- 13 confirmed cases were imported from 4 countries during Week 16 of 2017.

Disease \ Country	Indonesia	Philippines	China	Vietnam	Total
Amoebiasis	2	2			4
DF	2			1	3
Hepatitis A		1	2		3
Shigellosis	2				2
Typhoid fever		1			1
Total	6	4	2	1	13

Note: The statistics listed in this table include imported cases that were either confirmed or updated^{*} in the previous week.

- A total of 216 confirmed cases were imported from 20 countries in 2017.
- Top 3 imported diseases : Dengue fever (75), Amoebiasis (59), Shigellosis (24).
- Top 3 countries responsible for most imported cases : Indonesia (92), Vietnam (23), Philippines (21).

Summary of Epidemic

- **Influenza** : Although the recent temperature has fluctuated drastically, mild influenza activity similar to last week is expected.
- **Scrub Typhus** : The scrub typhus epidemic season has begun. The affected areas primarily include Hualien County and Taitung County.
- **Enterovirus** : Currently, enterovirus activity in the community remains low, and most cases are mild cases. EV71 is still circulating in the community.

Weekly Data of Notifiable Infectious Diseases (by week of diagnosis)

Case diagnosis year		week 17★		week 1-17			
Classification	Disease Diagnosed	2017	2016	2017		2016	
				Total cases★	Imported cases	Total cases★	Imported cases
Category I	Plague	0	0	0	0	0	0
	Rabies	0	0	0	0	0	0
	SARS	0	0	0	0	0	0
	Smallpox	0	0	0	0	0	0
Category II	Acute Flaccid Paralysis	0	1	14	0	13	0
	Acute Viral Hepatitis type A	14	6	225	22	213	16
	Amoebiasis	5	5	116	61	83	35
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	0	5	5	4	4
	Cholera	0	0	0	0	0	0
	Dengue Fever	4	1	76	76	528	93
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0	0	0
	Epidemic Typhus Fever	0	0	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	0	0	1	0	3	0
	Malaria	0	0	0	0	4	4
	Measles	0	0	5	4	2	2
	Meningococcal Meningitis	0	0	5	0	2	0
	Paratyphoid Fever	0	0	3	3	0	0
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	0	0	4	3
	Shigellosis	8	3	70	29	76	39
Typhoid fever	0	0	8	7	1	0	
West Nile Fever	0	0	0	0	0	0	
Category III	Acute Viral Hepatitis type B	3	1	53	2	29	0
	Acute Viral Hepatitis type C	5	5	78	0	63	1
	Acute Viral Hepatitis type D	0	0	1	0	1	0
	Acute Viral Hepatitis type E	0	0	7	2	6	3
	Acute Viral Hepatitis untype	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	1	0	1	0	4	0
	Haemophilus Influenza type b Infection	0	0	2	0	3	0
	Japanese Encephalitis	0	0	0	0	0	0
	Legionellosis	0	3	37	5	34	0
	Mumps	9	14	206	2	173	3
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	3	1	9	0	6	0
	Tetanus	1	0	3	0	3	0
Category IV	Botulism	0	0	0	0	1	0
	Brucellosis	0	0	0	0	0	0
	Complicated Influenza	19	10	186	3	1811	2
	Complicated Varicella	2	0	6	1	15	0
	Endemic Typhus Fever	0	0	7	1	3	0
	Herpesvirus B Infection	0	0	0	0	0	0
	Invasive Pneumococcal Disease	14	5	194	2	268	0
	Leptospirosis	1	0	24	0	14	1
	Lyme Disease	0	0	0	0	0	0
	Melioidosis	0	0	7	0	5	0
	Q Fever	2	0	4	0	11	2
	Scrub Typhus	2	4	97	0	74	0
	Toxoplasmosis	0	0	6	0	5	0
	Tularremia	0	0	0	0	0	0
Category V	Ebola Virus Disease	0	0	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Novel Influenza A Virus Infections	0	0	1	1	0	0
	Lassa Fever	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome Coronavirus	0	0	0	0	0	0
	Yellow Fever	0	0	0	0	0	0
Zika Virus Infection	0	0	1	1	1	1	

1. ★The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.
2. The following 8 chronic diseases are excluded from the table: MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen Disease and Creutzfeldt-Jakob Disease.
3. Numbers of mumps and tetanus cases are summed up by the week of report.
4. Since 2016/1/22, "Zika Virus Infection" was listed as a Notifiable Infectious Disease.

Suspected Clusters

- Forty clusters were reported, including 14 tuberculosis clusters, 6 diarrhea clusters, 12 upper respiratory tract infection clusters, 7 influenza-like illness clusters and 1 varicella cluster.

Imported Infectious Diseases

- 9 confirmed cases were imported from 4 countries during Week 17 of 2017.

Country	Indonesia	Philippines	China	Japan	Total
Shigellosis	4		1		5
Amoebiasis	2				2
Hepatitis A				1	1
DF		1			1
Total	6	1	1	1	9

Note: The statistics listed in this table include imported cases that were either confirmed or updated in the previous week.

- A total of 225 confirmed cases were imported from 20 countries in 2017.
- Top 3 imported diseases : Dengue fever (76), Amoebiasis (61), Shigellosis (29).
- Top 3 countries responsible for most imported cases : Indonesia (98), Vietnam (23), Philippines (22).

Summary of Epidemic

- **Influenza** : As the recent temperature has fluctuated drastically, influenza activity is expected to remain mild.
- **Scrub Typhus** : The scrub typhus epidemic season has begun. The affected areas primarily include Hualien County and Taitung County.
- **Enterovirus** : Currently, enterovirus activity in the community remains low, and most cases are mild cases. EV71 is still circulating in the community.

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