

### Epidemiology of Acute Diarrheal Disease Outbreaks Caused by Non-Routine Examination Pathogens in Taiwan

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#### Abstract

Diarrheal disease is the second leading cause of death in children <5 years old across the world. Every year there are nearly 1.7 billion cases of diarrheal disease in young children and around 5.25 million of them die. Bacterial, viral and parasitic enteric pathogens are associated with acute diarrhea. Infections are spread through contaminated food, drinking water, or from person-to-person transmission as a result of poor hygiene. A total of 9 pathogens are currently tested in our routine laboratory examination, including 2 viruses and 7 bacteria. Large diarrhea outbreaks with no pathogen detected by routine laboratory diagnostics made disease prevention and control difficult. We investigated 29 diarrheal clusters randomly from the 113 clusters without any routine enteric pathogen identified in 2018. Among 124 specimens with positive results of non-routine pathogens, 93 (75%) were positive for bacterial pathogens, and most of them were identified as pathogenic *Escherichia coli*. Further analysis of the geographic distribution of outbreaks revealed that relatively more clusters occurred in southern Taiwan. Nevertheless, patients positive for virus infection were significantly younger than the group of negative. Adopting the non-routine testing during an outbreak can provide insight into the pathogen that causes illness and will be helpful for the control and prevention of diarrheal disease outbreaks.

**Keywords:** Diarrheal disease outbreaks, non-routine examination, pathogenic *Escherichia coli*

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and Welfare, Taiwan  
DOI: 10.6525/TEB.202009\_36(18).0001

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Received: Apr. 19, 2019  
Accepted: Jul. 24, 2019

week 36–37(Aug. 30–Sep. 12, 2020)

DOI: 10.6525/TEB.202009\_36(18).0002

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

Case diagnosis year		Week 36★		Week 1-36			
Classification	Disease Diagnosed	2020	2019	2020		2019	
				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	1	1	19	0	43	0
	Acute Viral Hepatitis type A	1	3	61	7	68	19
	Amoebiasis	5	6	168	85	227	124
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	14	3	3	68	64
	Cholera	0	0	0	0	0	0
	Dengue Fever	1	26	78	63	462	381
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0	1	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	8	0	1	0
	Malaria	0	0	1	1	3	3
	Measles	0	2	2	2	125	48
	Meningococcal Meningitis	0	1	5	0	4	0
	Paratyphoid Fever	0	0	0	0	5	4
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	0	0	0	20	16
Shigellosis	2	1	107	21	97	34	
Typhoid fever	0	3	5	3	21	17	
West Nile Fever	0	0	0	0	0	0	
Zika virus infection	0	0	2	2	3	3	
Category III	Acute Viral Hepatitis type B	2	1	69	2	74	3
	Acute Viral Hepatitis type C	6	15	426	3	422	2
	Acute Viral Hepatitis type D	0	0	0	0	0	0
	Acute Viral Hepatitis type E	0	0	7	0	7	3
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	2	7	0	36	1
	Haemophilus Influenza type b Infection	0	0	3	0	1	0
	Japanese Encephalitis	0	0	21	0	20	2
	Legionnaires' Disease	4	1	194	8	184	13
	Mumps	11	12	338	6	411	7
	Neonatal Tetanus	0	0	0	0	0	0
Pertussis	0	0	8	0	23	0	
Tetanus	0	0	7	0	1	0	
Category IV	Botulism	0	0	1	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	0	3	30	0	45	1
	Endemic Typhus Fever	2	1	15	0	16	1
	Herpesvirus B Infection	0	0	0	0	0	0
	Influenza Case with Severe Complications	0	56	548	6	1585	6
	Invasive Pneumococcal Disease	4	9	179	0	303	2
	Leptospirosis	3	3	40	0	62	0
	Listeriosis	3	3	100	0	134	1
	Lyme Disease	0	0	0	0	1	1
	Melioidosis	1	6	10	1	30	0
	Q Fever	0	0	12	0	16	3
	Scrub Typhus	6	12	273	1	323	3
Toxoplasmosis	1	0	6	0	12	2	
Tularemia	0	0	0	0	0	0	
Category V	Ebola Virus Disease	0	0	0	0	0	0
	Lassa Fever	0	0	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome	0	0	0	0	0	0
	Coronavirus Infections	0	0	0	0	0	0
	Novel Influenza A Virus Infections	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
Severe Pneumonia with Novel Pathogens	4	-	492	437	-	-	
Yellow Fever	0	0	0	0	0	0	

- ★The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.
- MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen's Disease and Creutzfeldt-Jakob Disease are excluded from the table.
- Numbers of mumps and tetanus cases are summed up by the week of report.
- Since 2020/1/15, "Severe Pneumonia with Novel Pathogens" was listed as a Notifiable Infectious Disease.

## Suspected Clusters

- Thirty clusters related to tuberculosis (14), diarrhea (11), upper respiratory tract infection (3), and varicella (2) were reported during week 36.

## Imported Infectious Diseases

- There were 5 imported cases from 3 countries during week 36.

Diseases	Countries			Total
	Indonesia	Philippines	Japan	
Severe Pneumonia with Novel Pathogens	2	1	1	4
Amoebiasis	1			1
Total	3	1	1	5

- As of week 36, there were 645 imported cases from 49 countries. The top 3 countries are Indonesia (127), USA (95), and UK (72).
- The three notifiable diseases with the highest number of imported cases are Severe Pneumonia with Novel Pathogens (437), Amoebiasis (85), and Dengue Fever (63).

## Summary of Epidemic

- **Severe Pneumonia with Novel Pathogens** : The COVID-19 pandemic is still critical, and risks of importation and local transmission persist.
- **Dengue Fever** : The number of breeding sites increased because of rainfall in many counties/cities over the past few weeks. The risk of infection in the community raise.
- **Scrub Typhus** : Taiwan is in Scrub Typhus season. Taitung County is the highest risk area.
- **Enterovirus** : Taiwan is in enterovirus season. The risk of epidemic persist.

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

Case diagnosis year		Week 37★		Week 1-37			
Classification	Disease Diagnosed	2020	2019	2020		2019	
				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	1	1	20	0	44	0
	Acute Viral Hepatitis type A	0	1	61	7	69	19
	Amoebiasis	3	11	171	86	238	131
	Anthrax	0	0	0	0	0	0
	Chikungunya Fever	0	7	3	3	75	66
	Cholera	1	0	1	0	0	0
	Dengue Fever	1	12	79	63	474	390
	Diphtheria	0	0	0	0	0	0
	Enterohemorrhagic E. coli Infection	0	0	0	0	1	0
	Epidemic Typhus Fever	0	0	0	0	0	0
	Hantavirus Pulmonary Syndrome	0	0	0	0	0	0
	Hemorrhagic Fever with Renal Syndrome	1	0	9	0	1	0
	Malaria	0	0	1	1	3	3
	Measles	0	3	2	2	128	50
	Meningococcal Meningitis	0	0	5	0	4	0
	Paratyphoid Fever	0	0	0	0	5	4
	Poliomyelitis	0	0	0	0	0	0
	Rubella	0	1	0	0	21	17
Shigellosis	3	0	110	21	97	34	
Typhoid fever	0	0	5	3	21	17	
West Nile Fever	0	0	0	0	0	0	
Zika virus infection	0	0	2	2	3	3	
Category III	Acute Viral Hepatitis type B	1	3	70	2	77	3
	Acute Viral Hepatitis type C	13	9	439	4	431	2
	Acute Viral Hepatitis type D	0	0	0	0	0	0
	Acute Viral Hepatitis type E	0	1	7	0	8	4
	Congenital Syphilis	0	0	0	0	0	0
	Congenital Rubella Syndrome	0	0	0	0	0	0
	Enteroviruses Infection with Severe Complications	0	0	7	0	36	1
	Haemophilus Influenza type b Infection	0	0	3	0	1	0
	Japanese Encephalitis	0	0	21	0	20	2
	Legionnaires' Disease	8	5	202	8	189	13
	Mumps	14	11	352	6	422	7
	Neonatal Tetanus	0	0	0	0	0	0
	Pertussis	0	0	8	0	23	0
Tetanus	0	0	7	0	1	0	
Category IV	Botulism	0	0	1	0	0	0
	Brucellosis	0	0	0	0	0	0
	Complicated Varicella	0	1	30	0	46	1
	Endemic Typhus Fever	0	1	15	0	17	2
	Herpesvirus B Infection	0	0	0	0	0	0
	Influenza Case with Severe Complications	0	50	548	6	1635	6
	Invasive Pneumococcal Disease	4	7	183	0	310	2
	Leptospirosis	9	6	49	0	68	0
	Listeriosis	3	0	103	0	134	1
	Lyme Disease	0	0	0	0	1	1
	Melioidosis	3	1	13	1	31	0
	Q Fever	0	0	12	0	16	3
	Scrub Typhus	6	5	279	1	328	4
Toxoplasmosis	0	0	6	0	12	2	
Tularemia	0	0	0	0	0	0	
Category V	Ebola Virus Disease	0	0	0	0	0	0
	Lassa Fever	0	0	0	0	0	0
	Marburg Hemorrhagic Fever	0	0	0	0	0	0
	Middle East Respiratory Syndrome	0	0	0	0	0	0
	Coronavirus Infections	0	0	0	0	0	0
	Novel Influenza A Virus Infections	0	0	0	0	0	0
	Rift Valley Fever	0	0	0	0	0	0
Severe Pneumonia with Novel Pathogens	6	-	498	443	-	-	
Yellow Fever	0	0	0	0	0	0	

1. ★The weekly and cumulative total numbers include indigenous and imported cases of notifiable infectious diseases.  
2. MDR-TB, Tuberculosis, Syphilis, Gonorrhoea, HIV Infection, AIDS, Hansen's Disease and Creutzfeldt-Jakob Disease are excluded from the table.  
3. Numbers of mumps and tetanus cases are summed up by the week of report.  
4. Since 2020/1/15, "Severe Pneumonia with Novel Pathogens" was listed as a Notifiable Infectious Disease.

## Suspected Clusters

- Twenty-four clusters related to diarrhea (11), tuberculosis (7), upper respiratory tract infection (3), varicella (2), and fever of unknown origin (1) were reported during week 37.

## Imported Infectious Diseases

- There were 8 imported cases from 5 countries during week 37.

Diseases	Countries					Total
	Philippines	Indonesia	Thailand	Nepal	France	
Severe Pneumonia with Novel Pathogens	3	1		1	1	6
Amoebiasis	1					1
Acute Hepatitis C			1			1
Total	4	1	1	1	1	8

- As of week 37, there were 653 imported cases from 50 countries. The top 3 countries are Indonesia (128), USA (95), and UK (72).
- The three notifiable diseases with the highest number of imported cases are Severe Pneumonia with Novel Pathogens (443), Amoebiasis (86), and Dengue Fever (63).

## Summary of Epidemic

- **Severe Pneumonia with Novel Pathogens** : The COVID-19 pandemic is still critical, and risks of importation and local transmission persist.
- **Dengue Fever** : The number of breeding sites increased because of rainfall in many counties/cities over the past few weeks. The risk of infection in the community raise.
- **Scrub Typhus** : Taiwan is in Scrub Typhus season. Taitung County is the highest risk area.
- **Enterovirus** : Taiwan is in enterovirus season. EV71 remain active in the community.

The Taiwan Epidemiology Bulletin series of publications is published by Centers for Disease Control, Ministry of Health and Welfare, Taiwan (R.O.C.) since Dec. 15, 1984.

**Publisher:** Jih-Haw Chou

**Editor-in-Chief:** Yung-Ching Lin

**Executive Editor:** Hsueh-Ju Chen, Hsin-Lun Lee

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**Telephone No:** +886-2-2395-9825

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**Suggested Citation:**

[Author].[Article title].Taiwan Epidemiol Bull 2020;36:[inclusive page numbers]. [DOI]