



BRIEF REPORT

Epidemiological Characteristics of Imported Shigellosis in Korea, 2010–2011

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Abstract

Shigellosis is a global disease as food poisoning by infection of *Shigella* spp (*S. dysenteriae*, *S. flexneri*, *S. boydii* and *S. sonnei*). In Korea, approximately 500 cases of shigellosis have reported every year since 2004, and imported shigellosis is increasing gradually from 2006 in particular. According to increase of numbers of overseas travelers, the numbers of patients diseased with imported shigellosis is also increasing. We need continuous surveillance studies network (SSN) for control of imported shigellosis. We studied epidemiological characteristic of imported shigellosis by using database of Korea Centers for Disease Control and Prevention (KCDC) from 2010 to 2011. The imported shigellosis is analyzed on correlation with variable factors such as sex, age, symptom, visited country as well as *Shigella* spp in the database. Total 399 patients diseased with shigellosis have been reported between 2010 and 2011, The 212 patients (53.1%) among them were disease with imported shigellosis and the 205 patients (96.7%) were diagnosed as definite shigellosis. *Shigella sonnei* (65.6%) and *Shigella flexneri* (20.3%) were isolated in order. Clinical symptoms of the shigellosis were diarrhea (96.5%), abdominal pain (54.7%), fever (52.8%), chill (31.6%), and weakness (21.7% etc) in order. Duration of diarrhea was 1 to 5 days, the number of diarrhea was mostly more than 10 times, and type of stool was almost yellow stool. Almost shigellosis was occurred in the travelers visited to Asia (98.1%). Particularly, the occurrence rate of shigellosis was highest in traveler visited to Southeast Asia which is India (21.7%), Cambodia (19.8%), Philippines (17.9%), and Vietnam (9.0%) in order. According to increase of traveler to Southeast Asia, imported Shigellosis also increased. We need to strengthen the public health and hygiene, which is infection prevention rules, eating properly-cook food, washing hands, drinking boiled water, for traveler to Asia. The quarantine and surveillance system to control imported shigellosis is need continually in Korea.

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1. Introduction

Shigellosis is an acute infectious colitis caused by *Shigella* spp. that is transmitted by the direct and indirect fecal–oral route as well as by contact with contaminated water, food, hand, stool, and flies [1–5]. When compared with other pathogens, a very small amount (10–100) of *Shigella* spp. is enough to cause infection. Although infected healthy people recover from diarrhea within 5 days, infected young children, the elderly, and people with chronic illness are usually diseased with various other complications or severe dehydration that may become life threatening within a few days [6]. Approximately 1.4 million people have been infected by *Shigella* spp., with reports suggesting 600,000 deaths due to the infection. The majority of those who died because of this infection were children from developing countries under the age of 5 years old with bad hygiene practices, such as poor hand hygiene [7].

According to the report released by the Korea National Tourism Organization, the number of foreign tourists to the country has been on the rise since 2005, when 10.08 million people were reportedly visiting Korea every year [8], but the number temporarily decreased to 0.9494 million people in 2009 when swine flu was declared pandemic. However, the numbers increased again to 12.487 million people in 2010, and then to 12.694 millions in 2011. In particular, the number of tourists visiting Southeast Asia was increasing due to cheap travel costs for various cultural and sports activities available. It has been reported that the infection rates of tourists are high after visiting countries in the Southeast Asian region.

Shigellosis is the most common among a group of infectious diseases caused by various pathogens in Korea, including infections by six species of bacteria. A total of 927, 767, and 1117 cases were diagnosed with shigellosis in 2001, 2002, and 2003, respectively. Because of poor water quality and poor hygiene practices, less than 500 people have been reported to be infected annually since 2004 [9]. However, 104 of the 228 cases (45.6%) reported in 2010 and 108 of the 171 cases (63.2%) in 2011 were reported to be infected during their stay abroad. The number of cases of imported shigellosis is greatly increasing every year, noticeably since 2007, with a 43.8% percent increase in 2010 and a 7.9% increase in 2011, respectively, when compared with the previous years. This increase in rate could be attributed to the increasing number of overseas tourists. Therefore, continued analysis, observation, and research on the imported cases of shigellosis are needed.

In this study, we investigated a Korea Centers for Disease Control and Prevention (KCDC) statistical web report released in 2010–2011, which reported that 202 people were infected during their stay abroad among a total of 399 people studied. Based on the web reporting statistics of infectious diseases and an epidemiology survey, the general characteristics, occurrence, clinical symptoms, and country of infection of the imported shigellosis were studied.

2. Demographic Characteristics of Imported Cases of Shigellosis

The KCDC confirmed infection in 205 cases (96.7%) and suspected infection in seven cases (3.3%) among

Table 1. Distribution of reported imported cases of shigellosis by gender, age, and occupation, 2010–2011

	Both years	2010	2011
Overall	212 (100)	104 (100)	108 (100)
Gender			
Male	77 (36.3)	32 (30.8)	45 (41.7)
Female	135 (63.7)	72 (74.9)	63 (58.3)
Age (y)			
0–9	9 (4.2)	6 (5.8)	3 (2.8)
10–19	31 (14.6)	17 (16.3)	14 (13.0)
20–29	100 (47.2)	44 (42.3)	56 (51.9)
30–39	16 (7.5)	2 (1.9)	14 (13.0)
40–49	22 (10.4)	12 (11.5)	10 (9.3)
50–59	24 (11.3)	19 (18.3)	5 (4.6)
>60	10 (4.7)	4 (3.8)	6 (5.6)
Occupation			
Student	86 (40.6)	41 (2.4)	45 (41.7)
Teacher	2 (0.9)	1 (1.0)	1 (0.9)
Health professional (doctor, nurse, etc.)	2 (0.9)	0 (0.0)	2 (1.9)
Others	122 (57.5)	62 (8.1)	60 (55.6)

Data are numbers of cases (%).

Table 2. Distribution of reported imported cases of shigellosis according to species, 2010–2011

	Both years		2010		2011	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
Overall	77 (36.3)	135 (63.7)	32 (30.8)	72 (74.9)	45 (41.7)	63 (58.3)
<i>Shigella sonnei</i>	51 (24.1)	88 (41.5)	16 (15.4)	37 (35.6)	35 (32.4)	51 (47.2)
<i>Shigella flexneri</i>	14 (6.6)	29 (13.7)	9 (8.7)	21 (20.2)	5 (4.6)	8 (7.4)
<i>Shigella boydii</i>	3 (1.4)	1 (0.5)	1 (1.0)	1 (1.0)	2 (1.9)	0 (0.0)
<i>Shigella</i> spp.	6 (2.8)	13 (6.1)	6 (5.8)	13 (12.5)	0 (0.0)	0 (0.0)
Suspected	3 (1.4)	4 (1.9)	0 (0.0)	0 (0.0)	3 (2.8)	4 (3.7)

Data are numbers of cases (%).

a total of 212 imported cases reported. Compared with men (77 cases, 36.3%), women were more infected (135 cases, 63.7%). In addition, patients in the age group of 20–29 years (47.2%) were the most commonly infected. An analysis based on occupation showed that 86 students (40.6%), including kindergarten, elementary, middle, high school, and college students, accounted for the most distributions (Table 1). Table 2 presents information on imported infection caused by various *Shigella* spp.

3. Disease Characteristics Over Time

Shigella infection most commonly occurred during the period from July to August, in which 81 cases (38.2%) of shigellosis were reported, followed by 30 cases (14.2%) from January to February, 15 cases (7.1%) in June, 10 cases (4.7%) in March. Less than 10 cases were reported during the other month. Imported shigellosis outbreaks were highest during vacation season when the number of overseas travelers increased (Figure 1). *Shigella sonnei* was the most frequently isolated bacterium [found in 139 cases (65.6%)],

followed by *Shigella flexneri* [found in 43 cases (20.3%)] (Figure 2).

4. Geographic Distribution of Patients Residing in Korea

The highest number of patients resided in Seoul (60 cases, 28.3%) and Kyunggi (49 cases, 23.1%), followed by Busan (18 cases, 8.5%), Gyeongnam (17 cases, 8.0%), Incheon (15 cases, 7.1%), Daegu (12 cases, 5.7%), Chungnam (10 cases, 4.7%), Ulsan (8 cases, 3.8%), Jeonnam (7 cases, 3.3%), Gwangju (6 cases, 2.8%), Chungbuk and Gyeongbuk (3 cases each, 1.4%), Jeju (2 cases, 0.9%), and Daejeon and Jeonbuk (1 case each, 0.5%) (Table 3).

5. Clinical Symptoms (Multiple Responses)

Diarrhea was the most commonly reported (198 cases, 93.4%) clinical symptom, followed by abdominal pain (54.7%), fever (52.8%), chills (31.6%), weakness (21.7%), and vomiting (20.8%). In addition to nausea, feelings such as tenesmus and headache

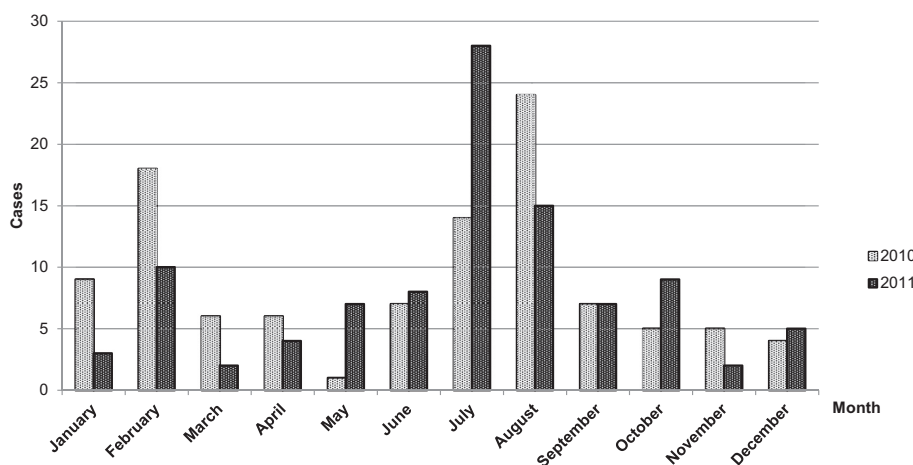


Figure 1. Reported imported cases of shigellosis by month for the period 2010–2011. Four records with missing information were excluded from the 2011 data.

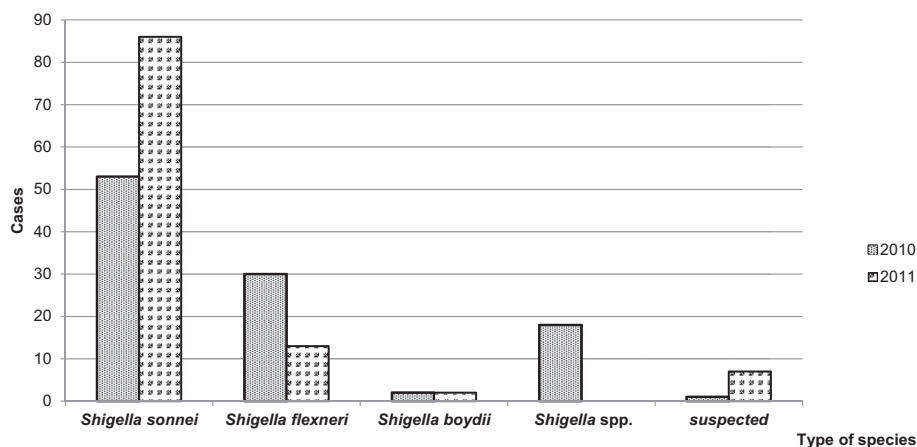


Figure 2. Reported imported cases of shigellosis by species for the period 2010–2011.

(reported in the order of maximum rates) were also reported (Table 4).

6. Diarrhea Aspects

The main clinical symptom of shigellosis was diarrhea (93.4%) with abdominal pain. The period of diarrhea varied between 1 day and 5 days in 139 cases (65.6%) and between 6 days and 10 days in 45 cases (21.2%), with most symptoms subsiding within 10 days. However, in four cases, diarrhea continued for more than 26 days (1.9%).

Diarrhea was typically characterized by yellow watery stools in 143 cases (67.5%) and bloody stools in 16 cases (7.5%). The frequency of diarrhea was more than 10 times in 101 cases (47.6%), three to four times in 21 cases (9.9%), five to seven times in 19 cases (9.0%), eight to nine times in 13 cases

(6.1%), and less than three times in 10 cases (4.7%) (Table 5).

Bloody stools caused by *S. flexneri* and *S. sonnei* infections were detected in 20.9% and 4.3% cases, respectively (Table 6). In order to compare the clinical severity of the symptoms between the two strains, we analyzed the fraction of bloody diarrhea using the Chi-square test, the results of which showed $p = 0.0017$, and the fraction of bloody diarrhea was significantly high in patients infected with *S. flexneri* (Table 7).

7. Regional Infection Status by Visiting Country

A total of 208 cases (98.1%) of imported shigellosis were reported to be infected during their travel to Asian

Table 3. Distribution of reported imported cases of shigellosis by place, 2010–2011

Province/City	Both years	2010	2011
Overall	212 (100)	104 (100)	108 (100)
Seoul	60 (28.3)	26 (25.0)	34 (31.5)
Daegu	12 (5.7)	9 (8.7)	3 (2.8)
Incheon	15 (7.1)	9 (8.7)	6 (5.6)
Gwangju	6 (2.8)	2 (1.9)	4 (3.7)
Daejeon	1 (0.5)	1 (1.0)	0 (0.0)
Ulsan	8 (3.8)	6 (5.8)	2 (1.9)
Gyeonggi	49 (23.1)	23 (22.1)	26 (24.1)
Gangwon	0 (0.0)	0 (0.0)	0 (0.0)
Chungbuk	3 (1.4)	2 (1.9)	1 (0.9)
Chungnam	10 (4.7)	1 (1.0)	9 (8.3)
Jeonbuk	1 (0.5)	1 (1.0)	0 (0.0)
Jeonnam	7 (3.3)	1 (1.0)	6 (5.6)
Gyeongbuk	3 (1.4)	2 (1.9)	1 (0.9)
Gyeongnam	17 (8.0)	8 (7.7)	9 (8.3)
Jeju	2 (0.9)	22 (1.9)	0 (0.0)

Data are numbers of cases (%).

Table 4. Clinical manifestations of imported shigellosis, 2010–2011

	Both years	2010	2011
Symptoms			
Fever	112 (52.8)	52 (50.0)	60 (55.6)
Chill	67 (31.6)	31 (29.8)	36 (33.3)
Nausea	36 (17.0)	15 (14.4)	21 (19.4)
Vomiting	44 (20.8)	19 (18.3)	25 (23.1)
Abdominal pain	116 (54.7)	52 (50.0)	64 (59.3)
Tenesmus	35 (16.5)	13 (12.5)	22 (20.4)
Diarrhea	198 (93.4)	95 (91.3)	103 (95.4)
Weakness	46 (21.7)	24 (23.1)	22 (20.4)
Headache	29 (13.7)	29 (27.9)	—

Data are numbers of cases (%). Headache is not included in the epidemiological investigation from 2011.

countries. In particular, the occurrence rate of shigellosis was highest when they traveled to the Southeast Asian countries. The highest number of cases was reported in those who visited India (46 cases, 21.7%), followed by Cambodia (42 cases, 19.8%), Philippines (38 cases, 17.9%), Vietnam (19 cases, 9.0%), and Indonesia (18 cases, 8.5%). In addition, infections were also reported in those who visited China (17 cases, 8.0%), Mongolia (11 cases, 5.2%), Laos (7 cases, 3.3%), Taiwan (4 cases, 1.9%), Myanmar and Thailand (2 cases each, 0.9%), Japan and Nepal (1 case each, 0.5%). By contrast, only one case each was reported in those who traveled to Egypt, Sudan, United States, and Brazil (Table 8).

8. Discussion

Shigellosis is a global disease caused by *Shigella* spp. food poisoning (*S. dysenteriae*, *S. flexneri*, *S. boydii*, and *S. sonnei*). In Korea, approximately 500 cases of shigellosis have been reported every year since 2004, and the number of imported cases of shigellosis has been gradually increasing since 2007. Because of the increase in the numbers of overseas travelers, the numbers of patients infected with imported shigellosis are also increasing. Therefore, there is a need for continuous surveillance studies in order to control imported shigellosis infection. In this study, we investigated the epidemiological characteristics of imported shigellosis

Table 5. Distribution of imported cases of shigellosis by duration, type, and the number with diarrhea, 2010–2011

	Both years	2010	2011
Duration of diarrhea (d)			
1–5	139 (65.6)	68 (65.4)	71 (65.7)
6–10	45 (21.2)	22 (21.2)	23 (21.3)
11–15	2 (0.9)	2 (1.9)	0 (0.0)
16–20	5 (2.4)	0 (0.0)	5 (4.6)
21–25	1 (0.5)	0 (0.0)	1 (0.9)
≥26	4 (1.9)	1 (1.0)	3 (2.8)
Unknown	16 (7.5)	11 (10.6)	5 (4.6)
Type of stool			
Yellow stool	143 (67.5)	67 (64.4)	76 (70.4)
Watery diarrhea	10 (4.7)	4 (3.8)	6 (5.6)
Mucus stool	14 (6.6)	6 (5.8)	8 (7.4)
Bloody stool	16 (7.5)	6 (5.8)	10 (9.3)
Others	7 (3.3)	7 (6.7)	0 (0.0)
Unknown	22 (10.3)	14 (13.5)	8 (7.4)
Number with diarrhea			
<3	10 (4.7)	2 (1.9)	8 (7.4)
3–4	21 (9.9)	9 (8.7)	12 (11.1)
5–7	19 (9.0)	7 (6.7)	12 (11.1)
8–9	13 (6.1)	8 (7.7)	5 (4.6)
>10	101 (47.6)	43 (41.3)	58 (53.7)
Unknown	48 (22.6)	35 (33.7)	13 (12.0)

Data are numbers of cases (%).

Table 6. Distribution of imported cases of *Shigella flexneri* and *Shigella sonnei* by type of stool, 2010–2011

	Both years	2010	2011
<i>S. flexneri</i> (n = 43)			
Yellow stool	23 (53.5)	16 (53.3)	7 (53.8)
Watery diarrhea	2 (4.7)	1 (3.3)	1 (7.7)
Mucus stool	5 (11.6)	4 (13.3)	1 (7.7)
Melena	9 (20.9)	5 (16.7)	4 (30.8)
Others	3 (7.0)	3 (10.0)	—
Unknown	1 (2.3)	1 (3.3)	—
<i>S. sonnei</i> (n = 139)			
Yellow stool	106 (76.3)	40 (75.5)	66 (76.7)
Watery diarrhea	7 (5.0)	3 (5.7)	4 (4.7)
Mucus stool	7 (5.0)	1 (1.9)	6 (7.0)
Melena	6 (4.3)	0 (0.0)	6 (7.0)
Others	3 (2.2)	3 (5.7)	0 (0.0)
Unknown	10 (7.2)	6 (11.3)	4 (4.7)

Data are numbers of cases (%).

Table 7. Comparison of melena positivity in *Shigella flexneri* and *Shigella sonnei* infections ($p < 0.05$)

	<i>S. flexneri</i>	<i>S. sonnei</i>	<i>p</i>
Melena (+)	9	6	0.0017
Melena (–)	34	133	

These figures indicate imported cases of *S. flexneri* and *S. sonnei* in Korea during the period 2010–2011.

infection using the KCDC statistics from 2010 to 2011. The imported shigellosis infection is analyzed based on correlation with variable factors such as gender, age, symptom, visited country, as well as *Shigella* spp. mentioned in the statistics database. A total of 399 patients were diagnosed with shigellosis between 2010 and 2011, of which 212 (53.1%) were with imported

shigellosis, 205 (96.7%) of which were diagnosed as definite shigellosis. The infection was mostly caused by *S. sonnei* (65.6%), followed by *S. flexneri* (20.3%). Shigellosis infections were most common in the age group of 20–29 years (47.2%), and gender-wise it was more common in females (63.7%). Clinical symptoms of the shigellosis infection were (in the order of highest)

Table 8. Distribution of imported cases of shigellosis by visiting country, 2010–2011

Visit country	Both years	2010	2011
Overall	212 (100)	104 (100)	108 (100)
Asia	208 (98.1)	102 (98.1)	106 (98.1)
Subtotal			
Nepal	1 (0.5)	0 (0)	1 (0.9)
Myanmar	2 (0.9)	0 (0)	2 (1.9)
Vietnam	19 (9.0)	14 (13.5)	5 (4.6)
India	46 (21.7)	14 (13.5)	32 (29.6)
Indonesia	18 (8.5)	8 (7.7)	10 (9.3)
Japan	1 (0.5)	0 (0)	1 (0.9)
China	17 (8.0)	9 (8.7)	8 (7.4)
Cambodia	42 (19.8)	12 (11.5)	30 (27.8)
Thailand	2 (0.9)	0 (0)	2 (1.9)
Laos	7 (3.3)	7 (6.7)	0 (0)
Mongolia	11 (5.2)	11 (10.6)	0 (0)
Philippines	38 (17.9)	23 (22.1)	15 (13.9)
Taiwan	4 (1.9)	4 (3.8)	0 (0.0)
Africa	2 (1.0)	1 (1.0)	1 (0.9)
Subtotal			
Egypt	1 (0.5)	0 (0)	1 (0.9)
Sudan	1 (0.5)	1 (1.0)	0 (0)
Americas	2 (1.0)	1 (1.0)	1 (0.9)
Subtotal			
USA	1 (0.5)	0 (0)	1 (0.9)
Brazil	1 (0.5)	1 (1.0)	0 (0)

Data are numbers of cases (%).

diarrhea (96.5%), abdominal pain (54.7%), fever (52.8%), chill (31.6%), and weakness (21.7%). The duration of diarrhea was 1–5 days, and the frequency of diarrhea was mostly more than 10 times. The type of stool was almost yellow. Shigellosis occurred in travelers who mainly visited Asia (98.1%). In particular, the occurrence rate of shigellosis was highest in travelers who visited Southeast Asia countries, with the highest rate reported in the following order: India (21.7%), Cambodia (19.8%), Philippines (17.9%), and Vietnam (9.0%). With increases in the number of travelers to Southeast Asia, the rates of imported shigellosis also increased. Therefore, there is a need to strengthen public health and hygiene practices, including implementing infection prevention rules, as well as creating awareness on the following for travelers to Asian countries: eating properly cook food, washing hands, drinking boiled water. A quarantine and surveillance system to control imported shigellosis is continually needed in Korea.

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