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Investigation of a Bacillary Dysentery Outbreak at One Nursing Home in Hukou Township, Hsinchu County

Abstract

An outbreak of bacillary dysentery at one nursing home in Hukou Township of Hsinchu County was reported on February 22, 2002. The purposes of this investigation were to comprehend the scale of the outbreak, its relevant epidemiological factors, and routes of transmission. Fifteen cases were diagnosed by the investigation, yielding an attack rate of 14.3% (15/105). Among them, seven were confirmed cases, five were suspected cases, and three were positive asymptomatic cases. The affected cases were residents of the nursing home; no staff members of the institution were infected. *Shigella flexneri* 1b was isolated from the rectal swabs of ten cases. According to the epidemiological curve and the distribution of location of affected patients' beds, the route of transmission was postulated to be through close contact. The probable initial transmission occurred when a new resident absconded from the home for a few days and then returned to transmit the disease to other residents. Deficiencies in the environment, hygienic practices of the foreign workers caring for the residents, and in the management and policies of the institution were noted. Health authorities should intervene to prevent future incidents.

Introduction

Shigella, a bacterium of the intestinal tract that induces diarrhea, is the primary cause of Shigellosis. The genus Shigella has four serogroups: *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii*, and *Shigella sonnei* (1). In Taiwan, outbreaks of *S. flexneri* occur most frequently in psychiatric hospitals and nursing homes (2,4). In schools and communities, infections of *S. sonnei* are more common, often transmitted by contaminated water sources (5,6).

On February 22, 2002, two patients of a nursing home in Hukou Township of Hsinchu County were sent to the local Catholic Mercy Hospital emergency department for treatment of severe diarrhea. Specimens were collected from the patients and tested negative for Shigellosis. However, since the condition of one of the patients did not improve, his specimen was recollected two days later and sent for testing to the Laboratory of the Center for Disease Control. This specimen was confirmed positive for *S. flexneri* 1b on February 27. In the meantime, the Catholic Mercy Hospital had treated three more patients from the same nursing home with intestinal tract symptomatology such as vomiting, diarrhea, as well as fever. The Hospital notified the Hsinchu County Health Bureau for investigation. Disinfection of the nursing home and screening of all residents and staff members of the home was carried out on the same day by the Hukou Health Station. Having received notice on March 4, the investigation team from Field Epidemiological Training Program (FETP) of the Center for Disease Control immediately conducted, jointly with the Northern Region Branch Bureau, Hsinchu County Health Bureau, and Hukou Health Station, an investigation of the outbreak. This report presents the scale of the bacillary dysentery outbreak, its relevant epidemiological factors, and routes of transmission.

The Background

The nursing home, a privately owned long-term care institution, is located in Hukou Township of Hsinchu County. The home is fenced off from its neighbors. The premises contain a three-story concrete building, three container annexes, one kitchen, one laundry site, and one swimming pool. The person-in-charge, his daughter, and the foreign workers occupy the three container annexes. The nursing home employs 14 foreign workers (8 Filipinos and 6 Indonesians); ten (five males and five females) of them care for the residents. In addition, there are two administrators and one food services employee. The nursing home has 87 residents (44 males and 43 females); most of them are unable to attend to their own activities of daily living; are mentally retarded; suffer from altered mental status; are speech and hearing impaired; and aged. Residents occupy the first and the second floors of the building in partitioned rooms in groups of one to four persons. Their work and rest periods proceed according to a schedule. Their activities, bathing and feeding are communally carried out. There is a bathroom on each floor. As most residents are bed-ridden, the bathrooms are used solely by those who are ambulatory, thus the number of bathrooms is adequate. No medical professionals are stationed in the home; but medical personnel are requested to visit the home occasionally to provide medical care and medication. Prescriptions are kept, though no medical or nursing care records are maintained. In case of emergencies, patients are sent to the nearby hospitals (e.g. the Catholic Mercy Hospital) for treatment. The foreign workers live in the first floor container annex and the dormitory on the third floor. No tap water is available and underground water is used.

Materials and Methods

Objects of Investigation

A total of 105 subjects, including two administrators, daughter of the person-in-charge, 87 residents of the home, 14 foreign workers, and one food services employee, were investigated.

Investigation Period

From the date of the initial report on March 4, 2002, till the end of the period of monitoring on March 24, 2002.

Medical Records and Confirmation of Cases

No medical or nursing care records are maintained in the home. Medical records were collected from the Catholic Mercy Hospital of Hukou Township and Tungyuan Hospital of Chupei City to evaluate the medical treatment and medications of the residents.

Inspection of the Environment

Inspection of the environment was conducted focusing on factors associated with the transmission of bacillary dysentery such as food supply, drinking water, kitchen, dining room, physical health of the food services worker, process of food preparation, storage, and delivery, and feeding procedures. Bathrooms, toilets and bedrooms were also carefully inspected.

Questionnaire Interview

A questionnaire interview was considered impractical as most residents are mentally retarded, have altered mental status, and are speech and hearing impaired.

Collection of Specimens

Human specimens: the Hsinchu County Health Bureau collected 103 rectal swabs from the residents and staff members on February 27. They were sent to the Laboratory of the Center for Disease Control for testing.

Environmental specimens: the Hsinchu County Health Bureau for testing by the Laboratory of the Center for Disease Control also collected ten specimens from the environment.

Visits to Hospitals

Visits were made to hospitals in the neighborhood that had provided medical services to the inmates in the past (the Catholic Mercy and the Tungyuan, for instance) to enquire about the medical treatment of the residents of the institution, their major symptoms and abnormal findings.

Definition of Case

A person who either stayed or worked in the nursing home from February 16 to March 24, 2002, who had more than two (inclusive) diarrhea stools per day, or diarrhea with one of the following symptoms: fever (38℃+), stool with mucus and blood, abdominal pain, or vomiting, was defined as a suspected case. A suspected case became a confirmed case when laboratory testing was positive for *S. flexneri* 1b. A case positive for *S. flexneri* 1b by laboratory testing without symptoms was defined as an asymptomatic case.

Results

Number of Cases and their Distributions

Fifteen residents met the definition of case. No staff members (administrators, food services worker, or any foreign workers) were infected. The 15 cases included: seven confirmed, five suspected, and three asymptomatic cases, yielding a total attack rate of 14.3% (15/105). The infected cases were seven males (46.7%, 7/15) and eight females (53.3%, 8/15). The median age of the cases was 59 years, ranging from 27 to 82. Of the 15, three were asymptomatic, accounting for 20.0%. Major symptoms of the 12 were: diarrhea (12, 100.0%), fever (8, 75.0%), abdominal pain (5, 41.7%), bloody stool with

mucus (3, 25.0%), and vomiting (2, 16.7%). All patients, including the asymptomatic cases, were sent to the Catholic Mercy Hospital for treatment under isolation. The duration of symptoms was three to five days, with an average of three days. The average number of days of hospital stay was seven. The epidemiological curve (Figure 1) showed that the index case became ill on February 22 (two cases showed symptoms on the same day, one was found negative by laboratory testing). Subsequently, one resident became ill on February 24, three on 26th, one each on 27th and 28th, and one each on March 4, 6, 9 and 10. No more cases occurred thereafter. As no single peak appeared on the epidemiological curve, the routes of transmission were likely to be chain contacts, and not from a common source. Distribution of resident beds is shown in Figure 2. The beds of cases were located in different areas on the first and the second floors; they did not concentrate in one area.

Inspection of the Environment

According to reports by the health bureau and the health station, the standard of hygiene and sanitation of the nursing home was considered extremely poor. Garbage and waste products were randomly discarded. After the outbreak of Shigellosis occurred, under supervision of the Hsinchu County Health Bureau, these deficiencies improved. The kitchen was an asbestos tile addition to the main building. A food services employee prepared food. Two inspections found the area to be relatively clean, and no skin lesions were found on the kitchen employee. There was a large freezer for food storage, though no disinfection facilities for dishes were available. When the food was cooked, a portion was set-aside for the foreign workers, and the rest was shared and distributed to the dining tables for the residents. The foreign caregivers fed patients unable to feed themselves. If patients were unable to chew, their food was pre-processed with food processors before feeding. No food items eaten by

cases of the present outbreak were pre-processed.

The home has no tap water facilities, and underground water is used. The well is located behind the main building, next to the swimming pool. Water is pumped up to two water towers on top of the building, and conveyed through two pipelines, one for water for daily use, and the other for a fire prevention water tower behind the main building. The well is more than 30 meters distance from the septic tank, meeting the 15-meter requirement. It is unlikely to be contaminated by the septic tank. No residual chloride was found in the water. The swimming pool had not been in use for a long time; water was still kept there for fire prevention. The water in the swimming pool was stagnant and littered with garbage and dead fish; the possibility of groundwater contamination and breeding of vectors exists.

There are two shower rooms, one next to the kitchen on the first floor, another in a corner on the second floor. Each shower room has three toilets, one shower and one washbasin for hand washing. The bathing of residents is carried out in two ways: the non-ambulatory residents were bathed by the foreign caregivers, using the same towel to dry up afterwards, a poor practice likely to transmit skin and other communicable diseases. The ambulatory residents bathed themselves; they were likely to use their own towels.

Laboratory Testing

Results of the laboratory testing of the 103 rectal swabs sent by the Hsinchu County Health Bureau to the Laboratory of the Center for Disease Control on February 27 were reported on March 4. *S. flexneri* 1b was isolated from 10 of the swabs. The ten environmental specimens collected from kitchen, toilets and water towers were found negative for both *Shigella* and *E. coli*.

Control Measures

Health education: posters were hung in the home; staff members were

assembled for health education classes on the nature of bacillary dysentery and other intestinal tract infections and their routes of transmission, symptoms, and methods of prevention. Training of the foreign caregivers was enhanced. They were instructed to wash hands after changing diapers, using the toilet, before and after contact with patients, and before preparing food. They should wear uniform and gloves.

Monitoring and reporting system: the home was asked to tabulate the daily number of inmates showing symptoms of diarrhea, and report by noon each day to the Hukou Health Station and Hsinchu County Health Bureau. Monitoring continued until 14 days after the last patient was discharged from hospital.

General screening: Most inmates could not attend to their own personal hygiene; rectal swabs were collected from them and the staff members. As most the inmates were unable to answer questions, questionnaire interview was not conducted.

Medical treatment of cases meeting definition: any patients meeting the definition of case were sent to the Catholic Mercy Hospital for isolation and treatment including antibiotics until testing of two stool specimens (24 hours apart) were reported negative for *S. flexneri*. They were then sent back to the home.

Environmental disinfection and health promotion: door knobs, tables and chairs, toilet facilities, and any places that the inmates were likely to have come in contact with, were disinfected with a bleach solution. Wastes were disposed of, and the general living environment tidied up. Hand washing liquid or bar soap was placed beside each washbasin. An automatic chloride apparatus was installed on the water tanks on top of the building to ensure that the residual chloride was maintained at 0.2 ppm, and monitored each day.

Discussion

In an investigation of a bacillary dysentery outbreak in a nursing home, seven confirmed, five suspected, and three positive but asymptomatic cases were found, yielding a total attack rate of 14.3% (15/105). The epidemiological curve by the date of onset of illness did not show a single peak, suggesting the infection was not caused by a common source. No *Shigella* or *E. coli* was isolated in water specimens collected from the kitchen, toilets and water towers. Food was all cooked. It was speculated that the outbreak was caused by close chain contact, and not by a common source. Distribution of the bed location of the 15 cases is shown in Figure 2. Patients beds were distributed in different sections on the first and the second floors, they were not concentrated in one area.

According to the findings of the Laboratory of the Center for Disease Control, the pathogenic agent of the present incident was *S. flexneri* 1b. It explained the cross infection among inmates. Major symptoms of diarrhea and vomiting also corresponded to the symptoms of bacillary dysentery. All these indicated that the present incident was a bacillary dysentery outbreak. There have been similar bacillary dysentery outbreaks in like institutions. The pathogenic agent of the bacillary dysentery outbreak in March 2000 in the Evergreen Psychiatric Hospital was also *S. flexneri* 1b, and all evidence suggested a person-to-person transmission (7). Transmission through personal contact in nursing homes should be given more attention, and more should be done to improve the management of sanitation and health education of these institutions (8,9). The foreign workers had been employed there for more than six months. Since they were screened for communicable diseases when they started to work, the likelihood of initial transmission by them could be excluded. Considering the distribution of beds of cases in relation to the spread of disease, the beds of affected cases were not concentrated in certain rooms. Three foreign workers

cared for the positive cases. They did not change gloves every time they had contact with a patient. The hygienic behavior of the caregivers could have had a significant association with the present incident (9).

Most of the residents were non-ambulatory and mentally retarded elderly, only a few residents were mobile. A 41-year old positive asymptomatic case surnamed Su was admitted to the home on February 19, 2002. He was able to ambulate freely, and often visited other wards to socialize. Likely due to poor adjustment to life in the new home environment, patient Su sneaked out and disappeared for four days, and was brought back on February 26. Other than this absconding incident, there was no record of inmates entering or leaving the institution. Medical records of the Catholic Mercy and the Tungyuan hospitals did not show treatment of residents with similar symptoms in the prior six months. Interviews with the person-in-charge of the home and other staff members also revealed that there had not been any residents or staff with watery or diarrhea stools prior to the outbreak. The assumption that bacillary dysentery had been present in the home for a significant time period was discarded.

The time between the admission of the later diagnosed positive asymptomatic case Su, and the onset of the first case fell within the incubation period of bacillary dysentery. It was therefore suspected, that Su brought in the infection from somewhere outside and transmitted to cases Chen and Wu when he visited them in the institution. It was, however, not possible to collect information from Su as he was unable to give an appropriate history due to the effects of a brain injury. Caregivers GR and CD due to their unhygienic practices could have spread the infection.

The food services worker prepared the three meals of the inmates. Inspection of food processing did not reveal any problems relating to food contamination. Food was cooked, and no cold dishes were provided. The cap,

uniform and gloves worn by the kitchen worker met requirements. After cooking, food was apportioned out, processed with a food processor for those who could not chew, and distributed to each inmate. Processing by a food processor could have contaminated the food. The foreign workers were educated in the process of maintaining the cleanliness of the food processor and the chopping board at all times. They were also instructed to change gloves and wash hands each and every time they cared for a patient (10). Utensils should always be kept clean and disinfected to avoid cross infection.

Although water sources were not found to be associated with the outbreak, since piped in tap water was not yet available, it was recommended that, to avoid disease transmission from the underground water supply, disinfection facilities should be installed to disinfect the water.

A coordination meeting was held by the County Health Bureau jointly with the Social Affairs Bureau and the Environmental Protection Bureau soon after the medical treatment of patients was completed to discuss the control and management of this type of institution as regards such issues as welfare care and environmental management. The nursing home was supervised in the upgrading of its standards and quality of care to become a model for other institutions to follow.

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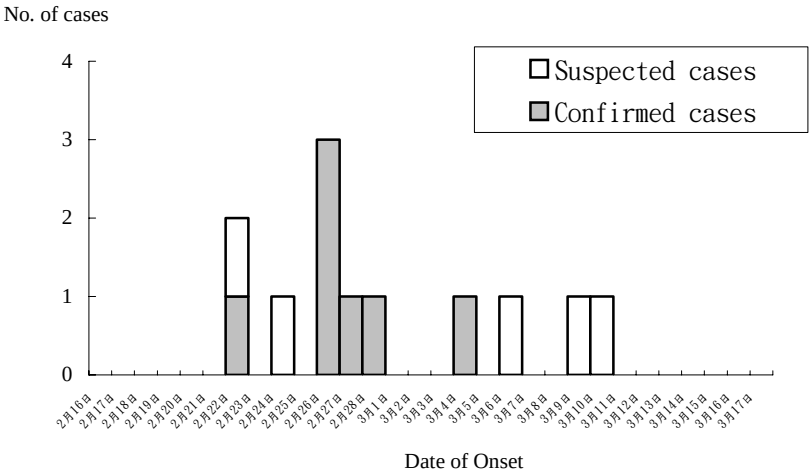

Figure 1. Distribution of Dates of Onset of Bacillary Dysentery at One Nursing Home, Hukou Township, Hsinchu County

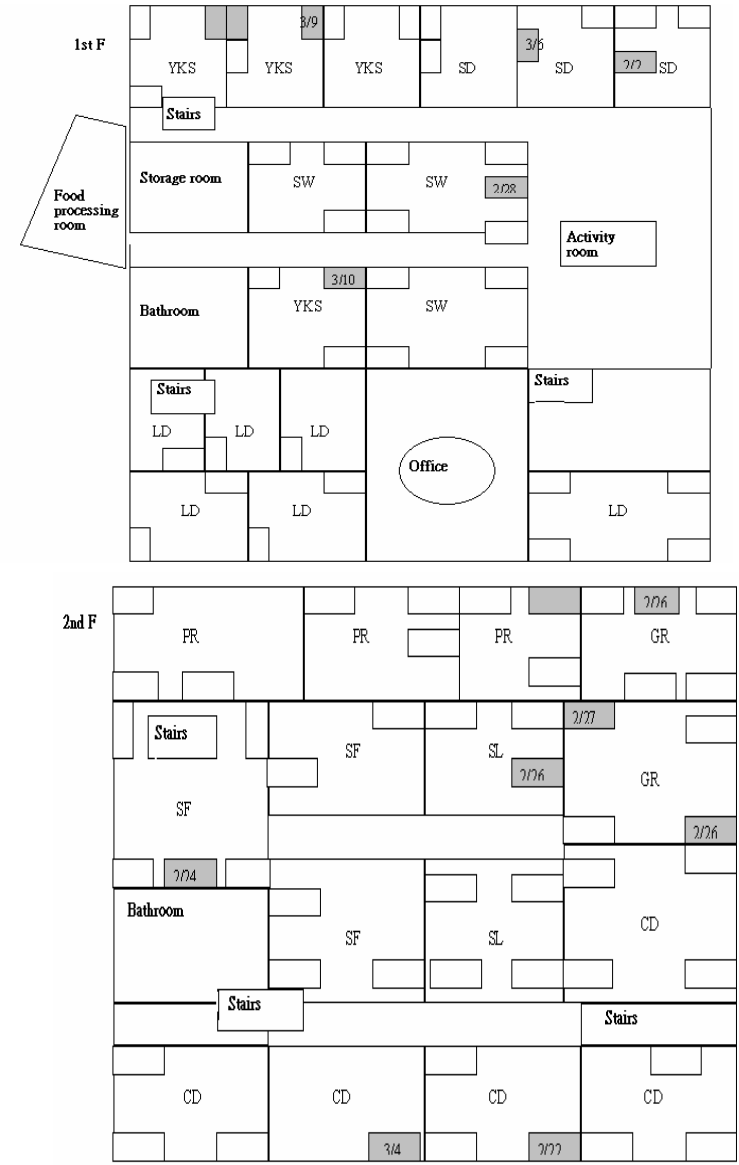

Figure 2. Location of Beds of Cases of Bacillary Dysentery at One Nursing Home, Hukou Township, Hsinchu County