Investigation of a Recent Incident Involving Residents Collectively Having Fever and Diarrhea at a Handicapped Institution in Changhua County

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Introduction

It was just a few minutes passed four, in the afternoon of July 14, 2006, when a telephone started to ring at the Third Branch of Taiwan CDC located in Taichung City. The call came from someone who worked at Changhua County Health Bureau, and the matter concerned a notification they had just received from a local otolaryngologist who stated that quite a few residents of a nearby handicapped institution had come to his clinic in the past week with symptoms like fever and diarrhea. The physician sending in the report suspected that there might be a cluster infection going on at that institution. The Third Branch immediately sent out their field specialists to combine forces with the staff of Changhua County Health Bureau to form a small team, which set off an epidemiological outbreak investigation. Their objectives were to first determine the size and scope of the epidemic if there was one, the route of disease transmission, and the identity of the responsible pathogenic microorganism; second to assess the efficiency and effectiveness of the existing preventive and control programs against this kind of infections in the neighborhood; and last but not least to prevent the endemic from getting worse.

Background information about the handicapped institution

This particular handicapped institution is an organization accommodating

physically and mentally handicapped individuals. It has an administrative staff and teaching personnel of 67 persons, who look after 253 handicapped people at present. Among the care recipients, there are 39 day-care commuters who come to the institution each morning, spend the day there, and return home in late afternoon. This institution occupies two buildings, and Building A happens to be a seven-storey, steel bar and reinforced concrete structure with a basement, where the residents carry out all their daily activities. In this Building A, the ground floor is divided into many administrative offices, and the second floor is occupied by classrooms for the care recipients. The third floor is a living quarter for the more severely handicapped residents (there are 47 boarders living on this floor). The fourth floor is another residence area but for preschool boarders (54 kids living there), and the fifth floor houses some employed boarders as well as live-in teachers of the institution (48 people living on this floor). The sixth floor is a large auditorium where the entire organization can meet and have lectures delivered. The top or seventh floor is their gymnasium, while the basement is their dining area. On the other hand, Building B is only one-storey high and normally used as a warehouse. A regular boarding resident will have three meals each day in the basement dinning hall, while those commuting students only have lunch at the institution. During the mealtime, all residents are grouped by their classes and everyone sits only with his or her own peers at the same table separated from other groups. Those different groups in the dinning hall include the preschool class, vocational skill class, early therapeutic class, laundry vocational class, and florist vocational class.

Size and scope of the epidemic

Up to July 19, 2006, 27 residents of the institution had been found stricken by gastrointestinal symptoms such as diarrhea and fever. The attack rate reached its peak at 10.7% (27/253). However, none of the teaching staff, working personnel, and day-care commuters was found suffering from similar symptoms. Among the

patients, 17 were male (63.0%) and 10 female (27.0%), and the age range stretched from 6 to 48 years with an average of 16. The most widely experienced symptom was diarrhea, which presented in 77.8% of the patients, followed by fever in 63.0% of the patients. Only one person presented with vomiting in the entire group, so the positive rate for this symptom was only 3.7%. Among these 27 cases, 5 lived on the third floor, so the attack rate among those sharing this floor was 10.6%; 15 sick people lived on the fourth floor, translating into an attack rate of 27.8% for this floor; and 7 sick persons lived on the fifth floor, with the attack rate being 14.6% (see Figure 1).

Suspected transmission route

From the epicurve (see Figure 2) showing onset dates of the reported cases in this group infection incident, we can see the distribution is much like a one single peak curve, which implies a good possibility of common infection source. After we looked into several factors that might have caused such a common infection incident, we found one seemingly suspect at first, which was the fact that water used at the institution was not further sterilized or treated before being put to use. However, since there were no more sick cases showing up after July 20, we ruled out tap water as the possible cause of the suspected cluster infection. Next, because none of the day-care commuting studnents got sick and they had lunch at the institution with other members of the institution, this sufficiently cleared up the possibility of any food served at lunchtime being the source. On the same token, the institution's teaching staff and service personnel were having meals together with the residents all the time, but none of them fell sick either. Therefore, we can rule out any correlation between any meals served at the institution and the norovirus infections. It also ruled out another possibility of the disease having been transmitted to the residents by any of the work staff. Moreover, we realized none of the residents owned and used his or her dining utensils like chopsticks, spoons, bowls, etc. The institution provided those food-serving tools to all diners

and washed them collectively after each use. Besides, in view of both the apparent attack rate and number of people getting sick being rather low, we believe the possibility of getting infected through contaminated dining utensils is not likely. Furthermore, all residents were either physically or mentally retarded in some way, thus all their activities in general are more or less restricted as compared to normal folks, and for any one of them to become a single spreader of the disease, the chance is also less than we would expect in normal situations. Finally, looking at the epicurve in Figure 2, if all 27 cases of this clustering fever and diarrhea outbreak were infected through a common source, this curve surely gives us an impression that the incubation period of such norovirus infection has to be 1 to 10 days, which does not coincide with the typical 1 to 2-day incubation period of norovirus noted in literature. All in all, a transmission route through a common infection source cannot explain the characteristics of this particular outbreak. After we ruled out all possible factors that could have pointed to a common infection source, we asked ourselves what would be the more likely transmission route for this clustering fever and diarrhea outbreak. We went back to look for recent similar incidents of the same nature and found that there were two reported clustering norovirus outbreaks that had quite familiar epicurves just like this one. One case happened in a ward of patients with respiratory diseases at a public (funded by DOH) hospital in Taipei County, and the other one took place in a ward housing chronic inpatients at a veteran's hospital located in Ilan County. The common pattern was that you saw only one or a couple of people fell sick first, followed by a surge of other persons living close by being struck sickness. We understand that transmission of norovirus in many cases has something to do with direct contact. In this incident, the first case was living in Room 403B on the fourth floor, and he started to have the symptom of diarrhea on July 10, so he was the index case by definition. On the following day, a resident living one floor above in Room 503A showed the onset of diarrhea and fever. After that, 25 other

residents of the institution fell sick between July 13 to July 19 with symptoms including diarrhea, fever, and vomiting (details in Figure 1). The fourth floor turned out to be the living quarter having the largest number of individual cases. We believe it is because the residents living there are preschool young children, and they are typically very active, thus having more chances to have body contact with one another. Besides, due to the young ages, their personal hygiene is comparatively less ideal. These explain why they were more vulnerable and indeed had higher case rate than other age groups. On the contrary, the third floor is where the severely handicapped residents live, and they are far less active than young children, thus having much less chances of contact within their own group, so the number of members falling sick and the incident rate are both at the lower end. However, the fifth floor is the living quarter of residents capable of being employed. They often have daytime jobs outside the institution and that would make the odds for them to catch norovirus infection on the premises lower than those staying home all the time. But on the other side of the coin, they are more independent and self-motivated and thus have more chances to catch the disease at the institution in the same period of time because they interact with others more often. This has been reflected in the fact that the fifth floor dwellers had an in-between number of individual cases and incident rate. Based on what we have looked into and analyzed, our conclusion is that transmission by direct contact seemed to be the most likely transmission route leading to this particular incident of group infection of fever and diarrhea.

Specimen collection and diagnostic results

Between July 14 and 18, we collected 5 virological rectal swabs, 5 bacteriological rectal swabs, 3 virological throat swabs, 3 bacteriological throat swabs, and 6 stool samples from patients of this group infection incident. By July 20, the laboratory diagnostic results from those specimens turned out as follows: only 3 stool samples and 3 specimens of virological rectal swabs appeared to be

norovirus positive, while the rest of the specimens were all negative. Based on the high number of diagnosed individual cases (3 persons in each category) and high positive diagnosis rates (50.0% out of all stool samples and 60.0% out of all virological rectal swabs), we believe that norovirus should be the agent that caused this group infection.

Measures enacted for prevention and control

During this group infection incident, this particular institution sent their sick residents separately to three nearby local medical facilities, i.e. Chien Chien Clinic, Dapu Otorhinolaryngology (ENT) Clinic, and Show Chwan Memorial Hospital, for diagnosis and treatment. Shortly afterward, the Health Bureau requested Dr. Jwei-shan Ma, head of Pediatric Infection Department at Show Chwan Memorial Hospital to visit the institution and help the management of the latter to move all their sick residents to an isolated area on the third floor of the main building to break up the transmission and to make investigation simpler and easier. Also starting from July 17, the institution suspended most of their teaching classes to protect the healthy residents from having contact with the potentially infected ones. For some of their classes, the apparent healthy residents moved out to meet somewhere in the warehouse building. Furthermore, the institution started a sterilizing routine of wiping everything in sight three times a day, and the residents were taught once again the right way to wash their hands and ensure personal hygiene. The institution was also asked to continue monitoring the health condition of every care recipient and must inform the Health Bureau immediately in case they have noticed any suspected new cases with gastrointestinal symptoms. Once all these prescribed measures were put into place and enacted, after July 20 we saw no more new individual cases showing up; and as to the earlier ones, except one case still feeling sick on that day this report was complied, others had all recovered from their illness.

Figure 1. Distribution of individual fever and diarrhea cases in a group incident on each floor of the main building of a handicapped institution located in Changhua County

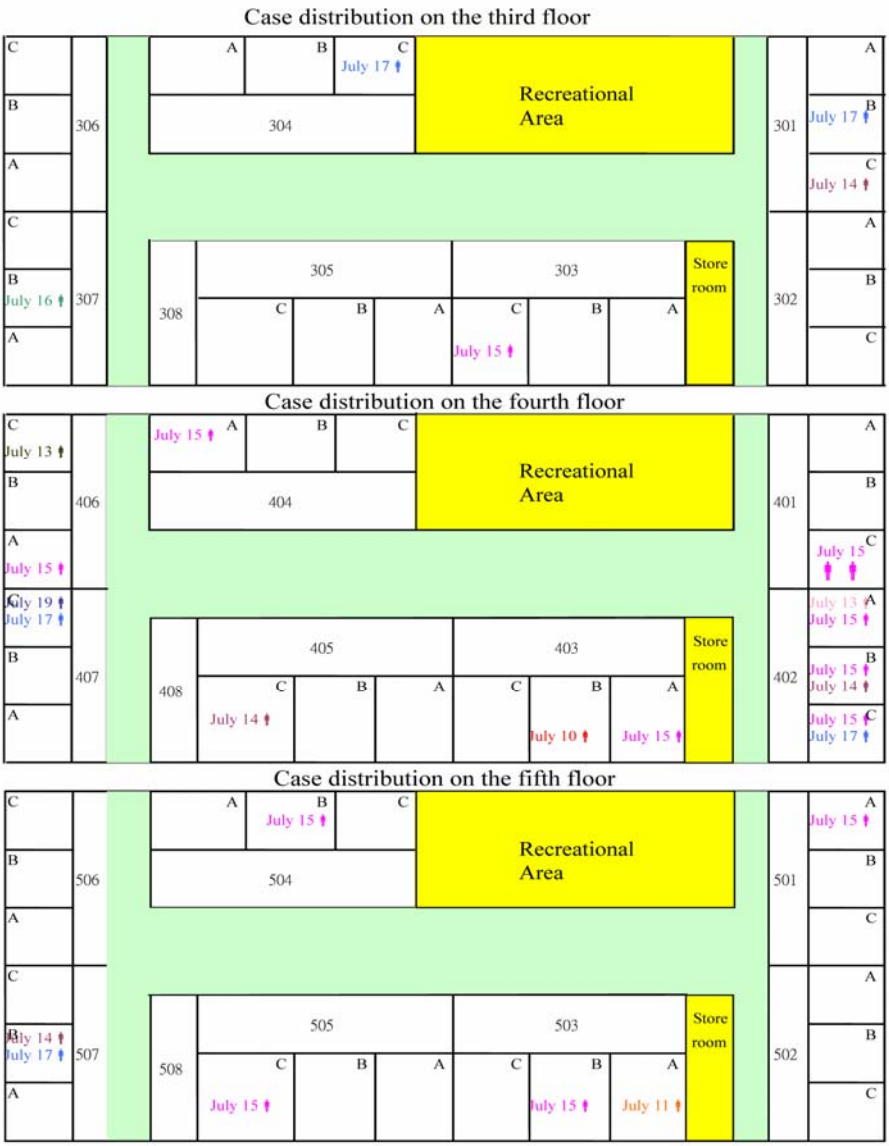

Figure 2. The distribution of onset dates for fever and diarrhea cases found among residents of a handicapped institution located in Changhua County