

Outbreak of Amoebiasis in a Psychiatric Hospital - KaoHsiung County

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Abstract

A psychiatric hospital in Kao-Hsiung County transferred their patients to other institutions in December 2007. Through routine screening, patients transferred to a hospital in Hua-Lian were suspected in having amoebiasis. Three were later confirmed to being infected with amoebas. Sixth Branch of the Taiwan Centers for Disease Control (TCDC) informed the Fifth Branch which began screening and investigating residents at the psychiatric hospital in Kao-Hsiung. An additional three cases were found resulting in a total of six confirmed cases of amoebiasis in this incident.

Keywords: moebiasis, high density institutions, stool microscopy, serum IHA, ELISA

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Background

On December 18, 2007, the Taiwan Centers for Disease Control (TCDC) received reports of 9 suspected cases of amoebiasis from a hospital in Hua-Lien. All suspected cases were residents at a psychiatric hospital in Kao-Hsiung. Because the psychiatric hospital in Kao-Hsiung was terminating some of its services, the hospital began to transfer patients out to other psychiatric facilities on August 21, 2007. There was an increase in the number of patients transferred to other locations starting on December 1. Within the groups relocated, 37 were transferred to a hospital in Hua-Lien on December 11. Through routine screening of the new patients, the hospital in Hua-Lien found nine patients with increased amoeba IHA. The hospital reported these nine patients in suspicion of amoebiasis on December 18. Repeat testing by TCDC confirmed three of the cases. At the same time, Fifth Branch of Taiwan CDC also began expanded screening and investigation of patients who had not yet transferred out of the facility in Kao-Hsiung. Rapid screening of stool using ELISA found three additional cases of confirmed amoebiasis. Overall, there were six cases of amoebiasis found through this investigation; however, none of the cases were symptomatic. Because this cluster of amoebiasis occurred within residents in a high density facility, early intervention was necessary to prevent the spread of the disease. This article recounts the process of the investigation in the hopes to provide information for similar outbreaks in the future.

Material and Methods

Institution

This was a psychiatric hospital in Kao-Hsiung County which housed patients with mild to moderate psychiatric diseases.

Target group

A total of 323 residents from the hospital in Kao-Hsiung County were transferred out to facilities across the country, including 2 to Nan-Tou County, 2 to Chang-Hua County, 12 to Tai-Nan City, 3 to Chia-Yi City, 1 to Chia-Yi County, 93 to Ping-Tung County, 47 to Kao-Hsiung City, 22 to Kao-Hsiung County, 18 to Tai-Tung County, and 109 to Hua-Lien County. There was 48 staff members at the hospital in Kao-Hsiung County. All 312 residents and 48 staff members were included in the target group.

Process of investigation

After receiving reports on December 18 of amoebiasis, the Sixth Branch immediately began investigating the outbreak and informing the Second Division and Fifth Branch. Fifth Branch began expanded screening on December 19. On December 23 Kao-Hsiung Department of Health collected fecal specimen for microscopy from 105 residents who had not yet been transferred out. On December 24, staff from the Fifth Branch and the Diagnostic and Research Center went to the hospital to conduct rapid ELISA for the remaining 101 residents. By December 25 all residents were transferred out.

Laboratory Diagnosis

Screening was conducted using one of the following: serum IHA, stool microscopy, or stool ELISA for antigen. If any of the screening tests were positive, confirmation using stool PCR was conducted.

Results

Background checks and physical examinations of the 312 residents found one person who had passed melena and diarrhea on December 1. Laboratory diagnostic tests ruled out amoebiasis in this patient. None of the 48 staff members

reported symptoms associated with amoebiasis and all had negative ELISA results. Thus amoebiasis was ruled out in all staff members without additional tests.

Of the 360 residents who were tested, 165 had at least one test performed (microscopy, serum IHA, or stool ELISA for antigen). The other 195 residents had at least two methods (microscopy plus stool ELISA, serum IHA plus stool ELISA, or microscopy plus serum IHA and stool ELISA) performed. There were a total of 130 specimens for stool microscopy, 176 for serum IHA, and 322 for ELISA (Table 1).

1. Serum IHA: Of the 176 specimens tested, 19 had titers greater than 1:128.

Three stool samples were collected from these 19 residents for a retest using

PCR while five were found to be infected with *E. histolytica* (Table 1).

Table 1. Lists the type of amoeba testing performed on residents' samples.

Methods	Number of cases	Number of PCR specimens sent	PCR positive
Microscopy	26	1*	0
Serum IHA	12	10**	3
ELISA	127	0	0
Microscopy and ELISA	31	3*	1*
Serum IHA and ELISA	91	5**	0
Microscopy, serum IHA and ELISA	73	11*	0
ELISA		4**	2**
Total	360	34	6

*Microscopy positive

**Serum IHA positive

2. Stool Microscopy:

(1) Of the 130 specimens tested, 15 were suspected to have parasites. Of these, 14 were found between December 21 and December 23 when the Kao-Hsiung Department of Health conducted screening. Of the 15 suspected specimens, only one was found to have *E. histolytica* infection through stool PCR (Table 1).

(2) Of the 322 specimens screened by ELISA, all were negative. Stool ELISA

was the only test conducted for 127 of the specimens while the other 195 residents also had either microscopy or serum IHA performed. Stool PCR was performed to confirm the presence of amoeba infection if patients had a suspected positive result by microscopy or serum IHA. Three of the cases were confirmed to have amoebiasis (Table 1).

Control measures

Because of huge number of the involved residents, some who were transferred to other institutions in other cities, first priority went to safeguarding the list of residents in the psychiatric hospital in Kao-Hsiung County from being leaked out. At the same time, it was also important to handle the transferring date and locations of the transferred residents. After data collection and analysis, it was found that residents were scattered in 10 different cities throughout Taiwan. Therefore the Department of Health of Kao-Hsiung County Government immediately informed related Public Health Bureaus and their Branches to help isolate recently transferred patients, collect specimens, and perform health checks to prevent further spread of disease to other high density institutions. In addition, the Department of Health of Kao-Hsiung County Government mobilized its medical staff to collect stool samples of the residents in the psychiatric hospital for stool microscopy (a total 105 specimens). Residents with suspected positive results of the stool microscopy were still evacuated to other institutions based on prior plans. The other institutions needed to collect 3 sets of stool samples for further examination and practice strict preventive actions like isolation, health monitoring, and health education. Regarding the 6 confirmed positive cases, the institutions that accepted them had to not only isolate, clean, and sterilize the local area, but they also had to help the confirmed positive residents take Flagyl

and Paromomycin for treatment. Health check via sample-collecting after treatment also had to be done.

The confirmed positive cases were all concentrated in residents transferred to a hospital in Hua-Lian. To avoid false-negative outcomes by a single examination thus resulting in some missing conditions in outbreak prevention, the Fifth Branch of CDC suggested that public health bureaus urge institutions to further examine the newly transferred residents with other screening methods like serum IHA or stool microscopy (if not examined before) even though they were negative for ELISA antigen or stool microscopy. Thus it could be made sure that there were no asymptomatic possible positive carriers left behind. Although positive confirmed cases were not found in other institutions, the Taiwan CDC urged the related institutions keep monitoring health conditions of their residents since amoebiasis has a longer incubation period. Residents with suspected symptoms had medication sent for immediately. In addition, preventative actions such as cleaning and sterilization of institution environment and reinforcement of personal sanitation habits were also done.

Discussion and Suggestion

Amoebiasis is a kind of global intestinal parasite infectious disease mainly caused by pathogenic *Entamoeba histolytica*. It is seen more in areas with poor environment sanitation especially in tropic and subtropical areas. On average fifty million people are infected per year in the world with 40,000 to 100,000 leading to deaths.

Amoebiasis is a type of fecal-oral infectious disease. Its clinical symptoms include asymptomatic infection, colitis, peritonitis and extra-luminal infection. [1, 2, 3] Close to 80-90% of infected people are asymptomatic. [1] Thus many

carriers are easily undetected. In this event the 6 positive cases confirmed by laboratory PCR all had no suspected symptoms. If they were not screened by the newly accepted institutions, they would not be screened out actively based on symptomatic conditions. Many researches have shown that the high risk groups of amoebiasis are travelers, immigrants, immune compromisers, residents and staff in psychiatric hospitals, and homosexual males. [3, 4] In this event the confirmed cases were all residents in the psychiatric hospital some of whom had the habit of drinking tap water and not performing proper hand-washing which all could have led to infection. In addition, sexual demands of the residents were a possible transmission route. Based on reports by the staff of the dismissed hospital, some residents were known to have had sexual intercourse privately. Though the sexual history of the 6 confirmed cases were not known, papers showed that oral sexual and anal sexual intercourse would definitely spread some fecal-oral diseases like hepatitis A and amoebiasis. In taking down the history for some amoebiasis patients, the sexual history could be considered as information to be taken down. In regards to high density institutions with high risk, CDC formulated “Items on Prevention and Monitoring of Infectious Diseases in High Density Institutions” and “Action Guideline for Infection Control in High Density Institutions” which included: regulations for health assessment needed for the newly accepted residents. If a resident has an infectious disease that needs to be isolated for treatment, they have to live in separate rooms or be transferred to other hospitals for further treatment. Within 1 week before the newly accepted residents are admitted to the institutions, they have to submit paper reports of negative results of Shigellosis, amoebiasis, and parasite infection testing or they be in isolation for 1 week to be observed for suspected symptoms of intestinal infections. After being confirmed safe, they are admitted to the general rooms (wards). [5] It is

hoped that the clustering of the infectious diseases could be avoided by such a strict monitoring. In this event, potential carriers were found by the hospital in Hua-Lien County due to the hospital's strict following of screening procedures for admission of newly accepted residents. Further investigation of this event found that only 7 out of 27 institutions had practiced strict screening during entry of the patients (25.9%). Therefore these high density institutions are urged to more closely practice the above regulations.

In the beginning of this event, the Department of Health of Kao-Hsiung County Government first employed stool microscopy to preliminarily screen the 105 hospitalized residents. The speed of stool microscopy was not sufficient for the huge number of residents that had to be screened. To quickly screen for amoebiasis of all the transferred and soon to be transferred residents in the hospital, Laboratory Research and Development Center examined 322 specimens with ELISA. Meanwhile, some institutions examined the accepted residents with scheduled screening for intestinal parasites including serum IHA and stool microscopy. Therefore they did not send specimens to the Laboratory Research and Development Center for antigen testing. The suspected positive specimens screened out by these methods were reported as suspected cases which then 3 sets of stool samples were collected and sent to the Laboratory Research and Development Center for final confirmation with PCR. As for stool microscopy, this is the most conventional way of testing which directly observes trophozoites or cysts of *Amoeba histolytica* in stool or tissue. Though this is a very direct way for examination, it is limited by factors such as poor specimen collection or poor examination techniques. For example white blood cells, platelets, or infection by other protozoa would interfere with the results. [4] In addition amoebas are excreted with stool intermittently so if stool examination is done only once, the

screening rate would not be high enough. It needs repeated specimen collection on order to attain a higher the screening rate. [6, 7] Therefore the sensitivity rate of stool microscopy is only 30%-50%. [3] More importantly stool microscopy could not differentiate morphologic patterns of different amoeba. That is to say it could not tell pathogenic *E. histolytica* from non-pathogenic *E. dispar* and *E. moshkovskii*.

The result of antibody titer is used in serum IHA method to decide infection or not. The basic reference value of antibody titer is 1:128. Though the test has a high specificity (90%), its sensitivity is only 40%-60%.[3] Whether or not the infection is treated, amoeba antibody titer will remain for years. Therefore IHA is not favored for diagnosis in the epidemic areas. In non-epidemic areas like Taiwan for the diagnosis of extra-luminal amoebiasis such as liver abscess, IHA could be used to help determine the final diagnosis since protozoa were not found in most of the stool samples,. As for the application of diagnosis of luminal amoebiasis, it was determined that in this event the serum IHA had 26.3% (5/19) positive predictive value for the diagnosis of active amoebiasis. Such a result demonstrated that serum IHA had a false-positive value (which might be attributed to the combination of previous infection conditions), but compared to the limitation of stool microscopy by man-made influence on examination techniques, serum IHA could be used in high density institutions for screening newly accepted residents when the equal examination techniques levels in different institutions are not be available. Residents whose specimens with higher antibody titer should be further confirmed by stool PCR to decipher whether worm-excreting is undergoing (active amoebiasis) or it is a result of a previous infection.

In addition to the above 2 examination processes, rapid screening for

amoebiasis was employed in this event with the help of Laboratory Research and Development Center. The greatest advantage of this ELISA antigen test is its rapidity and lack of subjective interference like stool microscopy. [3] The reagents used in the Laboratory Research and Development Center could not tell *E. histolytica* from *E. dispar* (similar to stool microscopy), while ELISA sensitivity could be up to 80%-99% [3] and it could be used in massive screening. Therefore antigen examination is a good method for screening though PCR sensitivity is higher than antigen examination [2, 8, 9]. The test costs more and needs a well-equipped laboratory which is why it is not a primary method for preliminary screening of amoebiasis. PCR (high specificity, which could be up to 100%, and is a diagnostic approach to differentiating pathogenic and non-pathogenic amoebiasis) [2, 8, 10] should be used as a confirmatory tool for the preliminary screening positive cases.

322 specimens in this event were tested negatively by ELISA, with further serum IHA or stool microscopy in the new institutions, 23 cases of suspected infection of amoebiasis were noted (9 IHA antibody titer over 1:128 while 14 abnormal stool microscopy). 3 out of 23 were confirmed cases by PCR (2 from IHA antibody titer over 1:128; 1 from abnormal stool microscopy). (Table 1) Therefore the false-negative rate in ELISA is at least 0.9% (3/322). Because further PCR was not conducted for all the negative ELISA cases, the true false-negative rate of ELISA is not known. It is believed that the sensitivity of ELISA is higher than that of stool microscopy. Whether or not stool microscopy or ELISA antigen testing was used, further PCR was needed for the positive results in both examinations.

Differences existed in this event and previous amoebiasis outbreak in high density institutions. The main difference was that the hospital planned to

terminate some services and had to evacuate its residents to other institutions. Coincidentally, it was found after a series of comprehensive screenings that the 6 confirmed cases were all transferred to a hospital in Hua-Lian. It was found with detailed investigation that 3 male cases lived in the second floor of the rear building while 3 female cases lived in the third floor of the same building. The average residency period of these 6 cases was 16 years. No group activities or fixed communication was found in these 6 cases.

In regards to the hospital in Hua-Lian, 109 residents were accepted this time, which amounted 35% (109/312) of all the transferred residents which might partially explain the high positive screening rate in this hospital. On the other hand, to avoid missed screenings in other institutions, public health bureaus were urged to monitor institutions to enforce both screening procedures during admission and that 2 different screening methods should be used if possible. Of the 312 transferred residents, 38 specimens were screened with a single method (stool microscopy or serum IHA). With negative screening results, these 38 specimens did not have further screening or PCR. Therefore it could not be known that whether there were some specimens with false-negative results. Serum IHA is the usual way for amoebiasis screening on admission in the hospital in Hua-Lian. In this event, most of the transferred cases had been examined by stool microscopy and ELISA before transferring. Thus the newly accepted residents of the hospital had taken the most complete screening and that might be the reason why the positive cases were all found in that hospital.

Whether the high density institutions seriously practice screening on admission should be the emphasizing issue from this event. It was found in this event that most of the institutions did not seriously practice the related regulations. In this event, in large scale of evacuation to other institutions, if suspected cases

could not be timely screened on transferring, the epidemic situation would further spread into the high density institutions nationally not just locally. Therefore periodical inspections of institutions and the enforcement of regulations on screening new residents should occur. The epidemic situation can be identified no matter the method used (stool microscopy or serum IHA). In addition to the routine screening on admission, all the high density institutions should keep monitoring health conditions of their residents. Once suspected symptoms are noted, immediate medical help should be sought and the CDC should be notified for the possibility of infectious disease as determined by physicians' diagnosis and treatment. Therefore the infected cases or cluster infection in the institutions could be found as soon as possible to avoid further spread of the epidemic situations.

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