



Original Article

Surveillance and Analysis of Cat-Scratch Disease, Taiwan, 2012

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Abstract

This study analyzes cases of cat-scratch disease (CSD) in Taiwan, 2012. Demographically, most infected persons were aged ≤ 39 years; $\geq 80\%$ of infected persons aged ≤ 10 years was hospitalized. There is no difference in infection between sexes. More cases occurred in northern and central Taiwan. There was no obvious seasonality during the year, but more cases occurred from late summer to early fall. Cat-scratch disease is associated with animal contact, especially cats. Early symptoms of the disease are similar to the common cold. However, with disease progression, lymphadenopathy develops. Before reporting the disease, doctors can ask patients about their animal contact history, and use information on possible disease among other family members, patient occupation, and environment around the house to identify possible source of infections. In the future, in addition to continue surveillance of cat-scratch disease, health education for the people with pets at home should be conducted to decrease the risk of infection among the public.

Keywords: cat-scratch disease, epidemiologic investigation, Taiwan

Introduction

Cat-Scratch Disease (CSD) is caused by *Bartonella henselae*. The disease is a zoonosis, and transmitted between cats by fleas. It is a category 4 notifiable disease in Taiwan. Cats are the main reservoir for *Bartonella henselae* [1,2]. Typically, patients with CSD present tiredness, granulomatous lymphadenitis, and sometime accompanied by continued fever [3]. Patients often have history of having been scratched, licked, or bitten by cats, with rash at scratched site. CSD may also cause localized lymphadenopathy, with symptoms similar to tularemia, brucellosis, tuberculosis, and plague; therefore, it may be confusing clinically.

The public is not familiar with CSD, even though the surveillance has shown increases in the number of cases. In 2008 and 2009, there were 28 and 27 cases reported, respectively;

in 2010 and 2011, the numbers have increased to 50 and 48, respectively (surveillance data from Taiwan Centers for Disease Control, TCDC). There are scanty epidemiological analyses on CSD in Taiwan. The lives of the people in Taiwan are closely linked to animals, more and more people keeping cats as pets at homes. This study describes the surveillance and epidemiology of this zoonosis in Taiwan for 2012. Epidemiologic analysis of confirmed cases helps in understanding the distribution of this disease in Taiwan, providing more information to the public, and may be used as the reference for health education and disease control policies.

Materials and Methods

Currently, the diagnosis of CSD must be confirmed by the Research and Diagnostic Center, TCDC. Two methods are used concurrently, culture of *Bartonella henselae* and serology. Culture for *Bartonella henselae* uses patient's whole blood or tissue biopsy of the disease site (usually lymph nodes). After culturing in solid medium, the bacteria are identified. Serology testing uses paired sera taken during acute and recovery periods for antibody determination [3,4]. The methods are briefly described below.

A. Bacterial culture

Bartonella henselae culture was performed on three solid culture media (two with 10% rabbit blood) at constant temperature [5,6]. Specimens include patient blood or tissue (lymph nodes). Blood was frozen and thawed repeatedly, and three solid media were plated with 100 µl of treated blood. Tissue specimens were smeared evenly on culture media directly. Media were placed in 35°C, 5% CO₂ incubators and observed every week for 12 weeks. If no colonies were formed after 12 weeks, the specimen was considered negative. If colonies were formed during incubation, then PCR using specific primers were performed [7]. If target length of PCR amplified products were found on gel electrophoresis, the products were sequenced. If confirmed by sequencing, then the specimen was considered positive for *Bartonella henselae*; otherwise, the specimen was considered negative.

B. Serological diagnosis

Serological diagnosis relies on indirect fluorescent assay for IgG and IgM antibodies. Paired sera taken from patients within 3 days and after 14 days of disease onset were collected. Sera were placed on slides coated with *Bartonella henselae* antigen (Vero cells infected with *Bartonella henselae* or bacteria obtained from blood agar) for reaction. Then a fluorescent dye conjugated secondary antibody was added, and interpreted under fluorescent microscope. If apple greenish fluorescence is observed, the serum is positive for *Bartonella henselae*. The final interpretation is as follows: 1. If the serum is IgM positive, then the case is positive; 2. If the serum is IgM negative but paired sera showed a 4-fold increase in IgG, then the case is positive; 3. If the serum is IgM negative and paired sera did not showed 4-fold increase, then the case reported as "sera did not show 4-fold increase in antibodies"; 4. If the sera tested negative for IgM and IgG, then the case is negative.

Results

To analyze the suspected CSD cases reported to the TCDC during 2012, we used the disease onset date for analysis. Only case with paired sera or patient with only one serum for serological testing because recovery phase serum could not be obtained (e.g., patient died) were included for analysis. Monthly number of specimens received and results for 2012 is shown in Figure 1. There were 286 cases reported. Among these, there were 826 specimens received, including sera, whole blood, and tissue. There were 69 positive cases; the positive rate was 24.1%. During the first quarter (January to March), there were 49 specimens received; positive rate was 16.3%. For the second quarter (April to June), there were 65 specimens received; positive rate was 24.6%. The third quarter (July to September), the highest number of specimens (98) were received; the positive rate was 29.6%. In fourth quarter (October to December), there were 74 specimens received; positive rate was 21.6%. Overall, there were more cases reported in the second half of the year. The positive rate during June to September was comparatively higher, with 25.9–34.3%.

Because *Bartonella henselae* is difficult to culture in the laboratory, there were no culture positive cases in 2012, therefore, analysis are based mainly on serology. Of the 69 cases serologically tested positive in 2012, the main clinical presentation were fever, headache, tiredness, and decreased appetite. There were 63 (91.3%) patients with lymphadenopathy, involving mainly lymph nodes in the head, neck, or upper extremities. Thirteen (18.8%) patients with rash at scratched site. There were 22 (31.9%) patients hospitalized. The cases consisted of 43 males and 26 females; the sex ratio was 1.65:1. Analysis of age group and hospitalization proportion (Figure 2) showed that 79.9% of the patients were ≤39 years of age; up to 83.3% of the patients aged ≤9 years were hospitalized; among adolescents aged 10 to 19 years, the hospitalization rate was 43.8%.

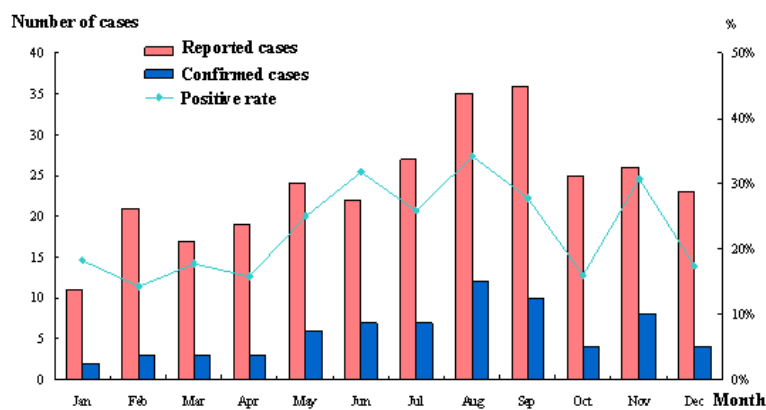


Figure 1. Reported and confirmed cases of cat-scratch disease by month, Taiwan, 2012.

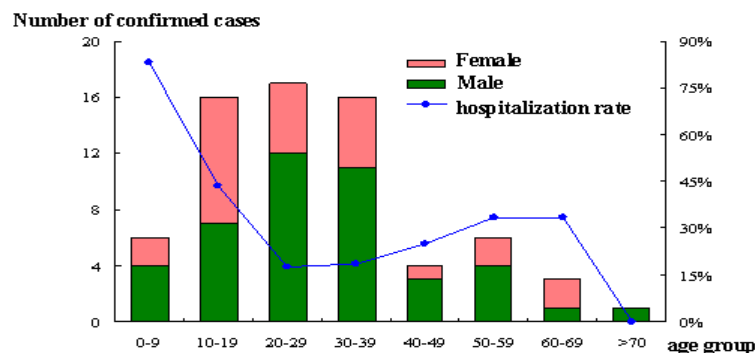


Figure 2. Age, sex, and hospitalization of confirmed cat-scratch disease cases, Taiwan, 2012

Analysis of CSD cases in 2012 by geographic area is shown in Figure 3. Northern and central Taiwan had more positive cases compared to other areas, including offshore islands. Further analysis by county/city showed that Taoyuan County, with 14 cases, had the highest number of cases, followed by New Taipei City, with 13 cases. The combined number of cases from these two neighboring county/city consisted of 39.1% of all cases in Taiwan. Miaoli County, Taichung City, Changhua County, and Kaohsiung City each had 5 cases. Yulin County, Chiayi County, and the island counties had no confirmed cases throughout 2012.

Literature review showed that CSD is often caused by contact, scratch, or bite of animals [1], so analysis of the association between confirmed cases and animal contact was conducted (Table 1). Among the 69 confirmed cases, 49 (70%) had history of contact with animals; among these, 48 had contacted with cats, including having cats as pets at home, scratched or bitten by cats, or worked in a pet shop. There were 97.9% of the cases with history of animal contact. There was one case of contact with dog; and 6 cases with no history of animal contact. There were 14 cases with no investigation, so history of animal contact is unknown.

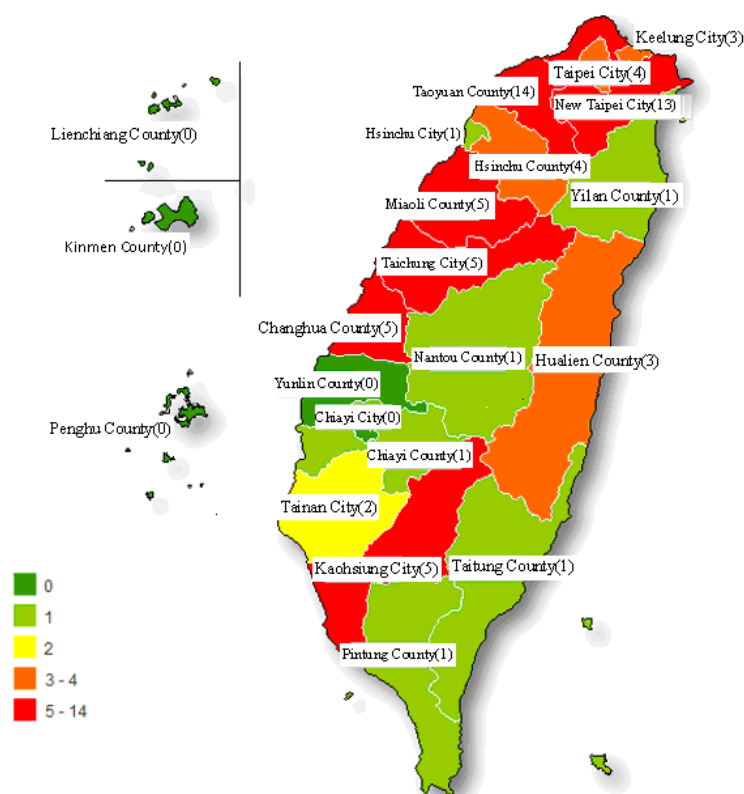


Figure 3. Geographic distribution of confirmed cat-scratch disease cases in Taiwan, 2012. (Data taken from Taiwan Centers for Disease Control; case selection by disease onset date in 2012)

Table 1. Cat-scratch disease positive patients and contact with animals.

	Total (n=69)	%
Contact with cats*	48	68.6%
Contact with dogs	1	1.4%
No animal contact	6	8.6%
Not investigated	14	21.4%

*Have cats as pets, bitten or scratched by cats, pet groomers.

Discussion

Analysis of seasonal changes of CSD in Taiwan, we found that the disease occurs year-round, with a relative increase during June to September (Figure 1). A possible reason is that *Bartonella henselae* is transmitted between cats through cat fleas, which breed better in warm and humid weather. June to September, corresponding to late summer to early fall in Taiwan, are the favorable months for cat flea breeding and disease transmission. Compared to the epidemiologic studies conducted in other countries, the season for CSD in Taiwan is slightly earlier. In Japan, 64% of the cases occurred during September to December, with a peak in November [8]. In the United States, the disease is more common in the second half of the year (July to December); the peak usually occurring in September [9]. In France, the disease is more common from November to January of next year, with a peak in December [10]. These are all temperate countries. However, regardless of the country's latitude, CSD occurs in late summer, fall, and winter.

Even though there is no difference of CSD occurrence between the sexes, severity of disease differs in different age groups. Older patients with CSD may seek medical attention, but their symptoms might not be severe enough to interfere with daily life, so most people need no hospitalization. On the other hand, for patients aged ≤ 19 years, and especially young children and babies, hospitalization is much increased ($p < 0.01$). This indicates that in younger patients, because of poor immunity, the symptoms are more severe, and require more medical attention. Regarding geographic distribution of the disease, there were more cases in the north and central areas. Taoyuan County and New Taipei City had a total of 27 cases, consisting of 39.1% of all cases; Kaohsiung City also had 5 cases. This difference might be caused by: 1. urban areas have more medical resources. Currently, most of CSD have been reported by regional medical centers, and there are more medical centers in the metropolitan areas, including Taipei City, New Taipei City, and Taoyuan County. With easy access to medical care, patients often go directly to medical centers, and the doctors in medical centers may be more familiar with CSD and have increased alertness of the disease. Therefore, there are more cases reported from these areas. In contrast, people in less urbanized areas might not have access to medical centers as conveniently, or the doctors there are not as familiar with the disease resulting in the lowered alertness. 2. Keeping pets have become a part of urban life. This study showed that 70% of the patients had history of animal contact. CSD is associated with history of animal contact, especially contact with cats ($p < 0.001$). According to the statistics provided by the Council of Agriculture, in 2011, there were 372,951 house cats in Taiwan, and 174,096 (46.7%) were in Taipei City, New Taipei City, and Taoyuan County. In addition, Taipei City, New Taipei City, and Taoyuan County also have 36.5% of domestic dogs [11]. These indicate that there are high proportions of households with pets in these areas. Keeping pets are often associated with having better financial status, thus providing time and space to keep pet cats and dogs. Having frequent contact with cats and dogs increased the risk of becoming infected by CSD in these people.

Analysis of the association between CSD cases and animals contact showed that CSD is highly associated with having contact with cats. However, in 6 cases, the investigation showed no history of contact with animals. These patients might have forgotten their contact with animals, not have been aware of the mild symptoms, or have been exposed to environments with high cat flea density, such as parks, basements, or parking lots frequently strolled by stray cats and dogs. Even though no cases have been reported as being infected by the bite of cat fleas, if a person with wounds comes into contact with the feces of cat fleas, the person might be infected by *Bartonella henselae*. Surveillance of the TCDC has shown that CSD in Taiwan have increased in recent years. With rising standards of living in Taiwan, keeping pets is becoming fashionable. With the additional effects of global warming, all can increase the survival of infected cat fleas, cause disease transmission, and resulting in the increase of CSD cases.

Taiwan's warm and humid summer is suitable for cat flea breeding. People having both children and pets, especially cats and dogs, should pay more attention to the cleanliness of household pets, keeping the pets from contacting with young children, to prevent the children from becoming infection and developing severe disease. Summers are also the season for enterovirus infections in Taiwan; furthermore, there are frequently influenza infections in the summer and fall in recent years [12]. Early symptoms of CSD include headache, fever, malaise, and loss of appetite; those symptoms are all similar to early infection of enterovirus, flu and common cold. Later symptoms, including lymphadenopathy and rash, might be confused with tularemia, brucellosis, and tuberculosis. Because CSD is a zoonosis, the route of infection differs from respiratory diseases. If clinician suspects of CSD, before reporting the disease, doctor can further assess the probability of CSD by ask patients about infections among other family members, patient occupation, the home environment, whether the patients have pets and history of recent cat scratches or bites. The TCDC should also educate the public about the disease. Furthermore, increase awareness of the disease among physicians through medical centers, medical associations, and local health bureaus. All of these can prevent the diseases and improve the public's health.

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Outbreak Investigation Express

The Investigation of a Tuberculosis Cluster in a High School in Southern Taiwan, 2012

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Abstract

A contact of a diagnosed tuberculosis (TB) case in a high school campus was confirmed to be infected with TB, triggering an alert on the Central Infectious Disease Tracking and Management System in July 2012. Upon investigation, the index case was a high school student and was diagnosed as a TB case in June 2011. This new case was reported when his chest X-ray showed abnormal lesions during the twelfth-month contact tracing examination since the index case was identified. After subsequent contact examinations, further four TB cases were reported as of December 2012. Including the index case, there were six reported cases in total. Among them, five cases had been confirmed, and the other one was excluded. The five confirmed cases were classmates, in which three cases had *Mycobacterium tuberculosis* grown from sputum cultures. The strains were sent to the Research and Diagnostic Center of Taiwan CDC for molecular typing. The results confirmed the same genotype of the three strains on April 10, 2013. Therefore, this event was determined to be a campus cluster of TB infection.

Keywords: tuberculosis, contact, cluster, treatment for latent tuberculosis infection (LTBI)

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