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Original Article

Features of leprosy transmission in pocket villages at low endemic situation in China

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To study the characteristics of leprosy transmission at low endemic situation and to analyze the reason why transmission still existed. A retrospective study was carried out on transmission of leprosy in thirteen leprosy high endemic villages in Wenshan district, Yunnan Province, China. A special questionnaire was designed for collecting the data. A total of 47 patients have been registered in 13 villages since 1991. Among them, 25 (53.2%) were leprosy household patients. The proportion of BI positivity was 57.4% (27). The average delay time from disease onset to diagnosis of leprosy was 12±7.9 months with a range of 1-36 months. The interval between 2 cases being detected in each village was in a range of 0.5 to 5.5 years. Many secondary patients occurred continuously after an 'index case' and they developed leprosy within the delay time of the disease of former patients. The authors here also reviewed some literature on chemoprophylaxis and discussed the importance. Most patients could not be detected at the early stage. It may be necessary of considering the chemoprophylaxis strategy among close contacts of leprosy to stop transmission in leprosy pocket areas.

Key words: Leprosy transmission, Case finding, Chemoprophylaxis

Introduction

The strategy of early detection and treatment for leprosy has been implemented in leprosy control program for nearly 50 years in China. The leprosy control program has achieved an elimination goal of leprosy at national level as the prevalence < 1/10000 by this strategy in early 1980s. Now the active case finding strategy was still carried out with annually following up leprosy household contacts and collecting information about suspected leprosy cases in the villages by paramedical workers. However, the number of newly detected leprosy patients in recent 15 years in China has not decreased significantly which fluctuated around 1600 new cases each year. The rate of the disability grade two among newly registered cases is still high above 20%. What is the reason for this phenomenon? Is there any defect in the leprosy control program in China? In order to seek the answer, we carried out a survey in leprosy endemic villages in Wenshan district, Yunnan Province, China to study the features of leprosy transmission.

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Patients and Methods

This is a retrospective study on leprosy transmission on a small scale. The study areas were Wenshan county and Guangnan county, Wenshan district, Yunnan province. The new case detection rate was 3.35/100000 and 2.0/100000 for both counties in 2008, respectively. Each county has a special unit for leprosy control with professional leprosy workers. The local leprosy control program has been well organized since introduction of MDT in 1986. However, the annual detection rate of new leprosy cases did not decrease significantly in recent 15 years. So, the thirteen villages with more than one patient to be detected since 1991 were selected and studied for the transmission of the disease. The total population for 13 villages was 8891 with a detection rate of 5.3/1000 during the observing period of 1991-2007 (Table 1).

A special form was designed and sent to professional workers working at Station for Leprosy Control at county level for collection of all information. The information of studied patients such as the name, sex, date of birth, residence, family history of leprosy disease, date of the disease onset, date of diagnosis of the disease, clinical classification of the disease, initial bacterial index was collected in the form for the study. All forms with useful information were collected by The National Center for Leprosy Control, China and data were put into computer for analysis.

The active case finding was a routine activity in study areas which was composed of leprosy suspect survey, household contact examination and the village spot survey in the local areas as stipulated by the local leprosy control program. Leprosy suspect survey was carried out by paramedical workers working at village clinics who reported suspected leprosy patients to the County Station for Leprosy Control at any time when they found one. The leprosy household contact examination was carried out by professional health workers working at County Station who visited patient's family at least once a year. The village spot survey was carried out also by professional health workers working at the County Station when a new leprosy patient was detected in a villager. All villagers were checked up clinically for whether he or she had an early sign and symptom of leprosy.

Results

A total of 47 patients have been registered in 13 villages since 1991. Among them, 25 (53.2%) were leprosy household patients. The proportion of BI positivity was 57.4% (27). Among the patients with skin smear positivity, 27.7% (13 patients) had a BI more than 3.0. The average delay time from disease onset to diagnosis of leprosy was 12 ± 7.9 months with a range of 1-36 months. The interval between two cases to being detected in each village was in a range of 0.5 to 5.5 years (Table 1).

It is interesting that occurring of patients in a village seemed a continuous chain reaction when analyzing the disease delay time in several villages with more than 3 cases. There was a 'index' patient, then many secondary patients occurred continuously. Many secondary patients developed leprosy within the delay time of the disease of the former patient. For example: at the village BLTW, the patient 1 developed leprosy in 1991 but he was detected and treated in 1993. We could confirm that the patient 1 was an infectious source of leprosy to the healthy people from 1991 to 1993 at the village. Before detection and treatment of patient 1, there was a victim of patient 2 who suffered from leprosy in 1992 and was detected together with patient 1 in the same year of 1993. Then no leprosy patient was detected in this village within 8 years. However, there was two patients developed leprosy in 1999. But, one patient was only detected 2001 and the other was detected in 2002. After 2002, four patients occurred in a continuous way. Each of four patients got infection of leprosy within infectious stage of previous patient due to undetected status (delay time). At the village GGDZ, YN and LLQP, the similar situation of leprosy transmission was revealed that several

Table 1: Information about leprosy in 13 villages in two counties

Name of county	Name of villages	Population	No. of cumulative patients	Cumulative rate of leprosy prevalence (%)	Detection rate during observing period (1/1000)
Wenshan	SKZ	487	5	1.0	6.2
	GGDZ	244	10	4.1	32.8
	YN	950	6	0.6	5.3
	LX	1629	4	0.2	1.2
	GTZB	282	7	2.5	10.6
	RHDH	590	5	0.8	3.4
	MSXF	540	6	1.1	5.6
	MZG	535	7	1.3	3.7
Guangnan	LLQP	319	17	5.3	12.5
	DDQJ	755	14	1.9	2.6
	LCML	228	14	6.1	8.8
	GM	1144	12	1.0	2.6
	BLTW	1188	25	2.1	6.7
Total		8891	132	1.5	5.3

Table 2 : Characteristics of patients with leprosy in high endemic villages

Name of villages	Observing period	No. of patients	Household patients	Delay time (months)	No. of BI positive	Interval between two cases being detected (years)
BLTW	1991.7-2005.11	8	5	3-18	6	1.7
GGDZ	1991.5-2005.3	8	4	2-36	5	1.7
YN	1996.1-2002.1	5	1	6-12	2	1.2
LLQP	1994.4-2004.12	4	4	5-18	1	2.5
GTZB	1992.2-1998.3	3	1	2-24	3	2.0
GM	1992.10-2006.4	3	2	7-18	0	4.7
MSXF	1998.1-2003.1	3	1	1-11	0	1.7
SKZ	1994.7-1998.7	3	2	6-31	2	1.3
DDQJ	1991.10-1993.6	2	0	14-19	2	1.0
LCML	1992.1-2003.10	2	2	10-18	2	5.5
LX	1997.8-1998.4	2	1	3-24	1	0.5
MZG	1996.8-2004.1	2	1	9-29	2	4.0
RHDH	2003.1-2007.10	2	1	7-21	1	2.0
Total	—	47	25	1-36	27	—

chain reactions of developing leprosy were occurred. At the village GGDZ and LLQP, there was a patient 8 and patient 4 was detected in 2005, respectively; however, it was extremely possible that several villagers or household contacts had been infected with leprosy during this period and were not detected. At some villages, we also observed that there was a 'blank period' which meant no new patient was detected by local health workers at that time. However, the 'blank period' does not mean that there was no leprosy transmission. There were some patients who might suffer from self healing infection or might be at the incubation period and slowly evolved towards clinical leprosy. It is true that after several years of 'blank period', there were again occurring new clinical patients with a similar circle of one index patient and followed by many secondary patients (Figure 1).

Discussion

There was a report that the annual number of new leprosy cases has not declined over the last 15 years in Brazil, indicating that leprosy transmission continued at the same level (Deps et al 2006). In a study in Thailand, there were 4.5% of eligible contacts and ex-patients with leprosy PGL-1 antibody seropositive (Kampirapap 2008).

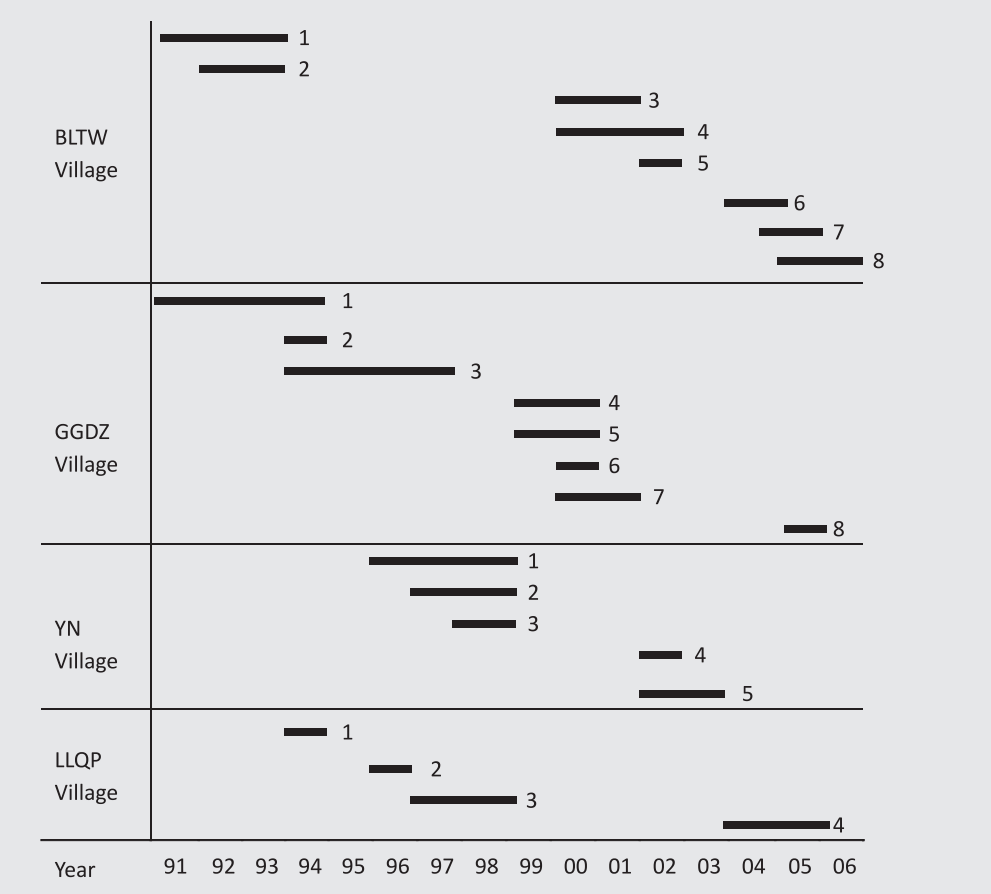

Figure 1 : Time distribution of patients developing leprosy in villages*.

*The beginning point of the bar means the time of disease onset, the end point of the bar means the time of detection

Bakker et al (2004) reported that there was an increased sero-prevalence for contact groups of leprosy living less or equal to 75 meters from two seropositive patients. They (Bakker et al 2006) also found that people living in households with more than 7 members had a 3.1 times higher risk of developing leprosy than households of 1-4 members. All facts showed that leprosy is an infectious disease and the contacts of the disease had a high risk in developing leprosy. Because multibacillary leprosy has a characteristic of lacking distinct signs and symptoms at the early stage; so, there is a difficulty in early case detection. There was an unpublished article that a study in China in 2007 showed that the mean delay from disease onset to diagnosis of 1462 new cases was 3.23 ± 4.5 years and 13.6% of patients were detected within one year after developing leprosy. This means that 86.4% of leprosy patients who were not detected within one year of onset of leprosy entered the cycle of transmission.

Although a continuous and vigorous leprosy control program has been carried out in China for many years, the annual case detection rate of leprosy does not decrease significantly. There are still around 1600 new patients detected annually (Shen et al 2008). The leprosy situation in Wenshan district in China showed a clear evidence. Wenshan district is located in southeast Yunnan Province, China with a population of 3,000,000 and is a leprosy pocket area as compared to other areas in China. There is a well organized local leprosy control program that has been conducted for more than 20 years. The main strategies of leprosy control are early active case detection, MDT, leprosy health education for the public, leprosy training for paramedical workers and following up leprosy house hold contacts. The puzzling fact to us is that conducting vigorous leprosy control activities for many years, there are still more than 100 new cases that are detected each year. In this study, the fact revealed the truth that leprosy was still on transmission. There was an interesting phenomenon in villages. First, there was an 'index' patient; then there was a chain of transmission with many secondary patients occurred continuously. The secondary patient usually developed leprosy within the delay time of the disease of former patient. Even though there was a 'blank period' of detection, it did not mean there was no leprosy transmission. It was more likely that the patient was at the incubation period of the disease or patients suffered from a mild type of leprosy and self healed before detection.

The early case detection, in theory, is a correct strategy in leprosy control program. However, carrying out a vigorous leprosy control program for many years, leprosy transmission still continues at the same level as before and there must have been a weakness in the leprosy control program. Considering that people with leprosy subclinical infection, some animals and environmental factors may act as an infectious source, the most important and effective action is to stop the cycle of leprosy transmission.

The current strategy in leprosy control in China focused on the early case detection but it is definitely not enough. Considering that a long delay time of the disease and 86.4% of patients can not be detected within 12 months of onset of symptoms, there must be a weakness in stopping circulating of leprosy transmission. This may be one of reasons why there still were many new patients who were detected each year in some areas. The prophylaxis may be an alternative and supplementary measure in leprosy control program.

Douglas considered that the prophylactic treatment of serologically identified high-risk contacts of incident patients should be an operationally feasible approach for routine control program (Douglas et al 2004). Nguyen et al (2000) reported that chemoprophylaxis using single 25 mg/kg dose of rifampicin in 2751 inhabitants in the Southern Marquesas Islands was 70% effective. In 2000, a randomized controlled trial of chemoprophylaxis using single 10 mg/kg dose of rifampicin among household contact was carried out in nine projects in India (Vijayakumaran et al 2000). Oo et al (2008) reported that the mean antibody titer of contacts of new patients before and after chemo-

prophylaxis using a single ROM regimen in treated group was significantly reduced compared to non-treated group in adults. Moet et al (2004) carried out a study of chemoprophylaxis using a single dose of rifampicin to prevent leprosy among close contacts in 2004. Moet et al (2008) reported that a single dose of rifampicin given to contacts of patients with newly diagnosed leprosy is effective at preventing the development of clinical leprosy at two years.

Based on the fact in our study, we consider that only early case detection is definitely not enough in controlling leprosy at the present situation of leprosy in China. Although there is a debate on effect of chemoprophylaxis for leprosy (Rahman 2008, Smith 2008) especially for its long-term effect at preventing the development of leprosy, the effect of chemoprophylaxis could be intensified by carrying out chemoprophylaxis at a short interval such as only one year interval for all close contacts of the first index patient so that transmission level of leprosy among population could be reduced and many secondary patients might be prevented from developing leprosy or at least markedly decreased. Otherwise, it is impossible to stop the leprosy transmission and decrease the number of new cases in a short time.

The above mentioned conclusion about chemoprophylaxis of leprosy is based on the review of some literatures. It is not a direct result of our study. However, based on the result of our study that there was a chain reaction in leprosy transmission, the chemoprophylaxis may be a useful measure to control the disease.

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