# CHAPTER I

# INTRODUCTION

## 1.1 Problems and Its Significance

Leprosy is an infectious disease which leads to physical and social consequences for those who affected. Regarding the leprosy situation in Thailand, it has been shown that the prevalence rate has gradually declined from 51.5 cases per 10,000 in 1964 (Pirayavaraporn, 1996) to 0.17 case per 10,000 inhabitants in 2007 (LCP, Annual Report, 2007). According to WHO definition, the prevalence of less than 1 per 10 000 populations means that leprosy is not a public health problem. However, the proportion of new cases with grade 2 disability (defined on page 41) at the time of diagnosis has not declined which could be interpreted that the delayed diagnosis still exists. From 1984 to 2007 it has been between 11.76% (Pirayavaraporn, 1996) and 11.46% (LCP, Annual Report, 2007). Leprosy program need to be sustained for many years to come.

Case finding is one of the core activities of leprosy elimination and control. It raises the leprosy awareness and encourages community's members to participate in detecting people with suspected leprosy symptoms to provide them with appropriate diagnosis and treatment before developing disease severity, developing disability, and further transmission. There are two methods of case finding which are; active case detection (ACD) (defined on page 40) such as rapid village survey and total population survey; and passive case detection (PCD) (defined on page 40) which is conducted by implementing intensive health education campaigns and encouraging suspected cases to voluntary report to health centers.

As prevalence rate has gradually declined and the budget is limited, appropriate case detection is needed. The researcher, therefore; is interested to carry out a comparative study of passive case detection alone and combined active and passive methods of leprosy case detection, to find out which one is most effective.

### 1.1.1 Nature of Disease

As explained in W.H. Jopling, A.C. McDougall (1995) and WHO (1998), leprosy is a chronic infectious disease caused by *Mycobacterium leprae*. It usually affects the skin and peripheral nerves, but has a wide range of clinical manifestations. The disease is classified as Paucibacillary or Multibacillary, depending on the bacillary load. Paucibacillary leprosy is a milder disease characterized by few (up to five) hypo-pigmented, anesthetic skin lesions (pale or reddish). Multibacillary leprosy is associated with multiple (more than five) skin lesion, nodules, plaques, thickened dermis or skin infiltration, and in some instances, involvement of the nasal mucosa resulting in nasal congestion and epistaxis.

The modes of transmission of *Mycobacterium leprae* remain uncertain, but most authorities consider the naso-respiratory tract the major route of entrance via aerosols (Ree & McDougall, 1976). Skin to skin transmission is also likely, but may require broken skin. There is no evidence that ingested food or water transmits leprosy.

The route of infection is thought to be via coughing and sneezing, but transmission is very inefficient. Of those infected with the slow-growing leprosy bacillus, few develop the disease.

Individuals exposed to *Mycobacterium leprae* who remain healthy either recognize a clinically important antigens which susceptible individuals do not, or they eliminate phagocytes bacteria more effectively, or both. The susceptible infected patients the disease develops insidiously with an incubation period is 2-5 years, but it shorter or longer times have been recorded. The signs and symptoms of the disease result from three interrelated processes; growth and dissemination of *Mycobacterium leprae,* host immune response and damage to nerves (Meyers and Marty, 1991). The average incubation period is 2-3 years, but it can range from 6 months to 40 years or longer (DermNet NZ, 2009).

Among communicable disease, leprosy is a leading cause of permanent physical disabilities. Timely diagnosis and treatment of cases, before nerve damage has occurred, is the most effective way of preventing disabilities due to leprosy; effective management of leprosy complications, including reactions and neuritis, can prevent or minimize the development of further disabilities, the disease and its associated

deformities are responsible for social stigma and discrimination against patients and their families in many societies.

Disability affects the economic status of patients principally as results of unemployment, which may arise either directly through a reduced ability to work (patient factors) or indirectly as result of adverse social customs, attitudes, or restrictive laws (society factors). In a wider sense, the socio-economic development of some endemic countries may have been hampered by a loss of manpower due to leprosy (Gilbody, 1992).

### 1.1.2 Global leprosy situation

The global burden of leprosy measured in terms of the number of new cases detected during the year is stabilizing, and there is a steady declining trend. Timely detection of new cases and prompt treatment with multidrug therapy continue to be the cornerstones of the strategy to reduce the burden of leprosy further. In all endemic countries, multidrug therapy is provided free of charge to all registered patients. National programs have emphasized the provision of good-quality diagnostic and treatment service that are equitably distributed, affordable and easily accessible (WHO, 2006).

The Global Strategy[1] for further reducing the leprosy burden and sustaining leprosy control activities (2006-2010); has been widely implemented in all WHO regions with the aim of sustaining the gains achieved under the initiative to eliminate leprosy as a public health problem. All major international and national organizations working to control leprosy have endorsed the global strategy and the guidelines and with their active support, national programs in all endemic countries have been successful in sustaining activities to control leprosy. The emphasis is increasingly being put on maintaining the quality of services and improving the care of patients in order to prevent disability and provide rehabilitation. (WHO, 2006).

In almost all of the highly endemic countries, control activities have been integrated within the general health care system, although details of the integration process vary depending on the health infrastructure and availability of resources. WHO

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[1] Global Strategy is a plan of action designed to achieve a particular goal by WHO' s committees

promoted integration since 1978, the integration process has been strengthened further, and this has led to improvement being made in the quality of care, the expansion of service coverage and the ability to sustain activities, especially at the peripheral level.

Leprosy burden as shown in Table 1.1, the global registered prevalence of leprosy at the beginning of 2007 was 224,717 cases; the number of new cases detected during 2006 was 259,017. During 2006, the number of new cases detected fell globally by more than 40,019 cases (13.4%) when compared with 2005. The number of newly detected cases exceeds the number of registered cases because the number of registered cases is calculated at the end of the year which some PB cases whose treatment is only 6 months were not included.

**Table 1.1 Leprosy situations by WHO region (excluding European Region)**

| WHO region | Registered prevalence at beginning of 2007 (PR: Prevalence Rate/10,000 population) | New cases detected during 2006 (DR: Detection Rate /100,000 population) |
|---|---|---|
| African | 29,548 (0.55) | 27,902 (5.15) |
| Americas | 64,715 (0.76) | 47,612 (5.58) |
| South-East Asia | 116,663 (0.70) | 174,118 (10.51) |
| Eastern Mediterranean | 3,986 (0.09) | 3,261 (0.71) |
| Western Pacific | 9,805 (0.06) | 6,124 (0.35) |
| Total | 224,717 | 259,017 |

Source: WHO Weekly epidemiological record 22 June 2007 No. 25,2007,82, 225-232

As seen in Table 1.2, the annual global detection of cases continued to decline. As of June 2007, new case detection reports are still being collected from some important countries in the African Region, such as Ethiopia, Guinea and Sierra Leone. The situation in the Eastern Mediterranean Region is stable. In the Region of the Americas, the reported increase in new case detection is mainly the result of increase observed in Brazil.

**Table1.2 Trend in the detection of new cases by WHO region (Excluding the European Region), 2001-2006**

| WHO region | No. of new cases detected | | | | | |
|---|---|---|---|---|---|---|
| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
| African | 39,612 | 48,248 | 47,006 | 46,918 | 45,179 | 27,902 |
| Americas | 42,830 | 39,939 | 52,435 | 52,662 | 41,952 | 47,612 |
| South-East Asia | 668,658 | 520,632 | 405,147 | 298,603 | 201,635 | 174,118 |
| Eastern Mediterranean | 4,758 | 4,665 | 3,940 | 3,392 | 3,133 | 3,261 |
| Western Pacific | 7,404 | 7,154 | 6,190 | 6,216 | 7,137 | 6,124 |
| Total | 763,262 | 620,638 | 514,718 | 407,791 | 299,036 | 259,017 |

Source: WHO Weekly epidemiological record 22 June 2007 No. 25,2007,82, 225-232

South East Asia has been known to be highly endemic for leprosy over the past century. This means that transmission of infection in the community has been very high in the general population of South East Asia.

**Table1.3 Prevalence rates and case detection rates in 4 countries that have not eliminated leprosy, 2007**

| Country | Registered prevalence (PR: no. of cases /10 000 population) | | | No. of new cases detected (DR: no. of cases/100 000 population) | | |
|---|---|---|---|---|---|---|
| | Beginning of 2005 | Beginning of 2006 | Beginning of 2007 | 2004 | 2005 | 2006 |
| Brazil | 30,693 (1.7) | 27,313 (1.5) | 60,567 (3.21) | 49,384 (26.9) | 38,410 (20.6) | 44,436 (23.53) |
| Democratic republic of Congo | 10,530 (1.9) | 9,785 (1.7) | 8,261 (1.39) | 11,781 (21.1) | 10,737 (18.0) | 8,257 (13.92) |
| Mozambique | 4,692 (2.4) | 4,889 (2.5) | 2,594 (1.29) | 4,266 (22.0) | 5,37 (27.1) | 3,637 (18.04) |
| Nepal | 4,699 (1.8) | 4,921 (1.8) | 3,951 (1.43) | 6,150 (22.7) | 6,150 (22.7) | 4,253 (15.37) |

Source: WHO Weekly epidemiological record 22 June 2007 No. 25,2007,82, 225-232

At the beginning of 2007, the United Republic of Tanzania achieved the goal of eliminating leprosy as a public health problem (defined as having a registered prevalence rate of <1 case/10 000 population). As shown in Table1.3, only 4 countries (out of 122 countries in 1985, which originally considered as leprosy endemic) have yet to achieve the goal of eliminating leprosy. These 4 countries are Brazil, the Democratic Republic of the Congo, Mozambique and Nepal. Brazil reported a significant increase in the registered prevalence at the beginning of 2007. This may be explained by the prevalence detection rate (prevalence rate < 1/ 10,000 population, it is meant by eliminating leprosy as a public health problem) in Brazil, which was observed to be >1. (Brazil has a prevalence rate higher than 1/ 10,000 population because their detection rate is still quite high and some MB cases are treated with 24 months multi-drug therapy (MDT). However, the detection rate in Brazil is declining but it is slow and so it will take some additional years for them to reach the goal of elimination of leprosy as a public health problem.) Additional efforts will be made to strengthen activities in these

countries to support them in their efforts to eliminate leprosy in the next few years. New case detection has continued to decline in WHO are South-East Asia, Eastern Mediterranean and Western Pacific regions. It is important that the coverage of leprosy control activities and quality of service are maintained and improved to ensure that the disease burden declines in all endemic countries, not only in terms of statistical numbers but also in terms of the reduction of disabilities, cases occurring among children and leprosy-related stigma.

### 1.1.3 Leprosy situation in Thailand

The sources of budget for leprosy control program are mainly from the government and non-government organization (e.g.: The Netherlands Leprosy Relief (NLR), German Leprosy Relief Association (GLRA), and Raj Pracha Samasai Foundation). The budget for leprosy control program from 1999 to 2006 is shown in Table 1.4.

**Table 1.4 Source of finance for the leprosy control program of Thailand from 1999-2003**

| Year | Recurrent costs[2] | | Capital costs[3] | | Total costs (Baht) | |
|---|---|---|---|---|---|---|
| | Govt. | NGO | Govt. | NGO | Govt. | NGO |
| 1999 | 24,933,400 | 3,314,068 | - | - | 24,933,400 | 3,314,068 |
| 2000 | 27,778,065 | 1,393,987 | 550,000 | - | 28,328,065 | 1,393,987 |
| 2001 | 27,906,060 | 5,543,954 | - | - | 27,906,060 | 5,543,954 |
| 2002 | 26,757,200 | 3,766,684 | - | - | 26,757,200 | 3,766,684 |
| 2003 | 24,534,900 | 3,096,200 | - | - | 24,534,900 | 3,096,200 |

Source: Annual reports, Leprosy Division, Thailand, 1999 to 2003

In the years 2004 to 2006 annual reports and thus data were not available because of the government reform of the Leprosy Division and the Phrapradaeng hospital.

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[2] Recurrent costs contain salaries, traveling allowance, training fellowship, supplies, drug and others.

[3] Capital costs contain buildings, equipments and vehicles.

To achieve the objective of the leprosy control program, the case finding activity is very important among other activities because many hidden cases are present in the country. The situations in case finding activities are shown in Table 1.5.

**Table 1.5 Mode of new case detection**

| Year | ACD | | Total | PCD | | | | Total | Total |
|---|---|---|---|---|---|---|---|---|---|
| | RVS | School exam. | ACD (%) | Voluntary report | Contact exam. | Transfer in[4] | unknown | PCD (%) | |
| 1999 | 125 | - | 125 (14.47) | 624 | 66 | 49 | - | 739 (85.53) | 864 |
| 2000 | 111 | 1 | 112 (10.80) | 769 | 76 | 53 | 27 | 925 (89.20) | 1,037 |
| 2001 | 81 | 2 | 83 (10.00) | 615 | 40 | 60 | - | 715 (89.00) | 798 |
| 2002 | 185 | - | 185 (18.50) | 684 | 44 | 87 | - | 815 (81.50) | 1,000 |
| 2003 | 38 | - | 38 (5.00) | 528 | 33 | 52 | 54 | 667 (94.00) | 705 |
| 2004 | 108 | - | 108 (16.00) | 425 | 55 | 48 | 16 | 544 (83.00) | 652 |
| 2005 | 90 | - | 90 (14.11) | 432 | 56 | 60 | - | 548 (85.89) | 638 |
| 2006 | 89 | - | 89 (13.00) | 475 | 36 | 55 | 10 | 576 (86.00) | 665 |

Source: Annual report, Leprosy control program, Thailand, 1999-2006.

According to the above table, PCD detects more new cases than ACD. Although the percentage of passive case detection is decreasing year by year except for some years, it is still higher than those of active case detection. In general, active case detection can pick up more early cases than passive case detection. From an economic point of view, more emphasis on early case detection is desirable, because, if the cases are detected at an early stage before stigmatizing disability sets in, there will

[4] Transfer in refers to patients transferred from another health institution where treatment was given.

be a reduction in economic burden which has a long term effect on the patients, program and the nation. From provider point of view, economic burden means expenditure necessary to take care of the cases disabled by leprosy. At the same time they are not fully productive. By preventing disability, productivity can be ensured and expenditure for taking care of the disabled avoided. Therefore, by doing economic evaluation of the program, we can assess which method of case finding activity has more cost effectiveness in term of the number of leprosy detected case when compared with cost incurred.

The World Health Organization (WHO) recognizes the importance of early detection and effective treatment as the keys to breaking the chain of transmission and eliminating leprosy (WHO,1998). Improvements in one or more of these outcomes would reduce the cost of individuals, the control program and the community. (Kaewsonthi,1995)

Although multidrug therapy has reduced the occurrence of disability, the proportion of treated patients who are disabled remains high in some areas because many patients are diagnosed after irreversible nerve damage has occurred. Early diagnosis and treatment are thus important in reducing the proportion of disabled patient.

## 1.2 Research Objectives

### 1.2.1 General objective:

- To identify the most cost-effective strategy for new case detection of leprosy in non-endemic and endemic areas of Thailand.

### 1.2.2 Specific objectives:

- To calculate the total costs of each case detection method (combined ACD and PCD and PCD alone), from a health provider as well as a consumer point of view.
- To analyze outcomes in terms of total number of new cases detected under each case detection method.
- To analyze the cost-effectiveness of each case detection method across endemic and non-endemic areas in Thailand.

### 1.3 Hypothesis

In endemic areas, the combined active and passive leprosy case detection method might be more cost effective than the passive case detection method. In non-endemic areas, however, the passive case detection method might be more cost effective than the combined active and passive leprosy case detection method, because few cases stay in these areas and doing active case detection is more costly.

### 1.4 Scope of the Study

This study focuses on provinces and districts in all regions of Thailand that implement both combined ACD and PCD as well as PCD alone methods (excluding region 12 due to it's an unrest area).