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The fight against Leprosy in Myanmar : a success story

Supplementary issue

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- The Myanmar Medical Journal, instituted solely for the purpose of advancing medical science, serves as one of the main forums for the publication of original research papers in the field of medicine and health in Myanmar.
- The journal also aims to serve as a medium for "continuing medical education" for medical practitioners. As such, it publishes case reports, review and educational articles, abstracts, and articles of general interest.
- Being the official organ of the Myanmar Medical Association, the journal functions as a bulletin board for dissemination and exchange of news of the activities of the various member societies and individuals.

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2) Pickup JC, Williams G (eds). Textbook of Diabetes. 2nd ed. 1997. Blackwell Science, Oxford. pp 25-26.
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(this will be freely available online)

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INVESTIGATIONS If relevant

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TREATMENT If relevant

OUTCOME AND FOLLOW-UP

DISCUSSION Include a very brief review of similar published cases

LEARNING POINTS/TAKE HOME MESSAGES 3 to 5 bullet points - this is a required field

REFERENCES Vancouver style (Was the patient involved in a clinical trial? Please reference related articles)

FIGURE/VIDEO CAPTIONS fig res should **NOT** be embedded in this document

PATIENT’S PERSPECTIVE Optional but encouraged

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Contents

The fight against leprosy in Myanmar: a success story

FOREWORD

The Myanmar Medical Journal is publishing a supplementary issue on “The fight against leprosy: a success story” which is a collection of articles written by authors representing various categories of health professionals that worked for leprosy control in Myanmar for decades. These articles cover various aspects of leprosy control such as strategies, operational guidelines for implementing activities, epidemiological trends, rehabilitation, reducing stigma, discrimination and research that was carried out in Myanmar to support field activities. Special emphases were given in the respective articles to the changes that occurred over time in various areas of leprosy control activities, from the time it was established after the country's independence up till the present time. These articles also highlighted the challenges, constraints and achievements of the National Leprosy Control Programme in its efforts to fight this centu y’s old dreaded disease in the country.

The National Leprosy Programme achieved the goal of Eliminating Leprosy as a Public Health Problem in 2003, and almost 13 years have passed since this milestone achievement. However, the fight against leprosy is still not over as yet for the National Leprosy Control Programme, and its efforts must be maintained till the country is finally free from this disease. It is hoped that this supplementary issue on leprosy will provide health professionals in Myanmar with some insights into how the programme started out, at what stage it is now and where it plans to go in future.

Editor
Myanmar Medical Journal
Myanmar Medical Association

1. Leprosy

Kyaw Lwin[I], Tin Myint[II], Maung Maung Gyi[III]

1.1 What is leprosy?

Leprosy is often referred to as "one of the oldest diseases known to humankind"[1]. The earliest written record describing leprosy was found in India in about 600 BC. Leprosy is a chronic infectious disease that affects the skin and nerves. Without proper treatment leprosy ultimately causes very severe deformities and permanent disabilities. Historically, it is one of the most dreaded diseases in all communities globally. It has destroyed untold number of lives not by killing the infected person but as a consequence of stigma and discrimination resulting from the disease.

1.1.1 Agent

In 1873, Dr Armauer Hansen reported his finding [2] of rod shaped bacilli which were later called *Mycobacterium leprae* and recognized as the causative agent. *Mycobacterium leprae* is a slow growing bacterium that has a great infinity for endoneurium and the Schwann cells covering the nerves. It is an acid fast bacilli (AFB) and up till now it has not been possible to culture the bacilli. The bacilli does not survive in the environment for more than 9 days[3] (mean temperature 36.7° and humidity 77.6°). For research purposes the bacilli is cultivated in the foot pads of immuno-compromised mice.

1.1.2 Host

Humans are known to be the main host for the bacilli and as such it is also the major source of infection. In the Americas Region, nine-banded armadillos are known to be infected with *Mycobacterium leprae* in the wild and it has been reported recently that human beings have been infected from these wild armadillos in the Southern parts of United States of America. This has been proven by DNA sequencing and now leprosy is considered to be a zoonotic disease in the Americas[4].

1.1.3 Transmission

The mode of transmission of *Mycobacterium leprae* is still not clear but it is widely accepted that it is primarily transmitted from human to human through the respiratory route and through the injured skin[5]. It is still not clear how the bacillus is actually transmitted from the source to the skin but drop-let infection is widely accepted as the most likely method of transmission.

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The infectiousness of a leprosy patient is related to the bacteria load in the body. It has been found that a single dose of rifampicin 600mg reduces the load of the bacilli in the body to very low levels and as such the infectiousness becomes negligible. This means that after taking the first dose of Multidrug Therapy (MDT) the patient is no more infectious[6].

The incubation period is usually 2-10 years[7]. In individuals whose immunity is good the incubation can be shorter (2 - 5 years).

1.2 Clinical features

Leprosy is basically a skin disease and the most common signs and symptoms of leprosy are usually seen in the skin which appears as a single or multiple hypo-pigmented (white) or hyper-pigmented (reddish) patch. In some cases, there can be reddish nodules or shiny diffuse thickening of the skin. In addition, the bacilli also attack the peripheral nerves and as a result of which the nerves are damaged and manifest clinically as thickened, hard and enlarged nerves. Because peripheral nerves are damaged, areas of the skin supplied by the damaged nerves loose the sensory function. The patient does not feel any pain in the areas of the skin lesion. In addition, the muscles supplied by the damaged nerve will also become weak and ultimately atrophy if not treated at an early stage. Sometimes, in patients with low resistance to M. leprae infection, the skin lesions appear as small reddish infilt ations or reddish nodules on the face, ear lobes, body and extremities[8]. Leprosy skin patches do not itch.

1.3 Diagnosis

The diagnosis of leprosy is based generally on clinical signs especially in the field where reliable and well functioning laboratory is usually not easily accessible. Leprosy is diagnosed when one of the following cardinal signs is present[9].

- Definit loss of sensation in a pale (hypo-pigmented) or reddish (hyper-pigmented) skin patch
- A thickened or enlarged peripheral nerve with loss of sensation and/or weakness of the muscles supplied by that nerve
- The presence of AFB in a slit skin smear

1.4 Treatment

A three-drug combination treatment known as multidrug therapy (MDT) which includes dapsone, clofazimine and rifampicin was first recommended y WHO in 1982[10].

Patients presenting with 1 - 5 skin lesions are regarded to be having a low bacillary load in the body. Such cases are classified as Paucibacillary (PB) leprosy and a 6 month fi ed duration course of MDT treatment with the following 2 drug combination is given[11].

- Rifampicin 600 mg once a month
- Dapsone 100 mg daily

For PB patients aged 10 - 14 years the following 2 drug combination treatment is given for a duration of 6 months.

- Rifampicin 450 mg once a month
- Dapsone 50 mg daily

Patients with 6 skin lesions and more are regarded to have a high bacillary load in their body and they are classified as Mutibacillary (MB) leprosy. The following 3 drug combination treatment is given for a period of 12 months fi ed duration treatment:

- Rifampicin 600 mg once a month
- Clofazimine 300 mg once a month and 50 mg daily
- Dapsone 100 mg daily

For MB patients aged 10 - 14 years the following 3 drugs combination is given for duration of 12 months:

- Rifampicin 450 mg once a month
- Clofazimine 150 mg once a month and 50 mg on alternate days
- Dapsone 50 mg daily

Children under 10 years of age are treated with an appropriately reduced calculated doses of the MDT drugs as follows:

- Rifampicin 10 mg/kg body weight once a month
- Clofazimine 1 mg/kg body weight on alternate days
- Dapsone 2 mg/kg body weight daily

Side effects of MDT drugs are usually rare and mostly it is non-fatal. Rifampicin causes red colouration of the urine, clofazimine causes the skin to darken (it disappears within 6 - 12 months after MDT treatment is stopped) and dapsone causes anemia and allergy (sulphur allergy). In rare instances patients taking MDT may develop skin rashes, itchy skin, urticaria, jaundice and renal failure. In such cases MDT is stopped and the patient has to be referred immediately to a specialist.

1.5 Relapse

Relapse is defined as re-occurrence of the disease at any time after completing treatment with MDT. During the dapsone monotherapy period the relapse rate was around 2 - 4% or 7.66 to 9.0 per 1,000 person years[12] in Myanmar. Under MDT the relapse rate declined dramatically to about one-tenth of what it was during dapsone monotherapy days. The cumulative relapse rate was 0.77% for MB and 1.07% for PB[13]. Relapse occurring after MDT treatment is relatively a rare event and all patients are successfully treated with a second course of MDT whenever relapse occurs[14].

1.6 Complications

Though leprosy is not a fatal disease, it has been dreaded throughout the past centuries in all communities around the world. This is because of the disfigurements it causes in patients as a result of complications. Impairments first occur in the extremities and face. If left untreated it finally ends up as disabilities and disfigurement . These disabilities and disfigurements are the main reasons for causing great fear towards the disease. It has created a lot of discriminations and stigma in various communities around the world. The lives of millions of leprosy patients have been destroyed over the past centuries because of stigma and discriminations. Even now in this 21st century, stigma and discrimination towards leprosy patients still exists.

Complications seen in leprosy patients are mainly due to nerve damage. The most common complications seen in a person affected by leprosy are:

1.6.1 Reactions

1.6.2 Tropic ulcers

1.6.1 Reactions

There are 2 major clinical types of reactions. Type I also known as reversal reaction and Type II or erythema nordosum leprosum (ENL). There are no clinical or laboratory test available as yet to predict which patient will develop reaction or not and when it is going to occur.

Type I reaction occurs in all types of leprosy patients and is recognized by swelling and redness of the skin patches. It is sometimes associated with loss of nerve function (muscle weakness) along with pain and tenderness developing in one or more peripheral nerves.

Type II reaction (ENL) occurs in MB patients and is recognized by the appearance of reddish painful nodules all over the body. Patient can also have high fever, lethargy and neuritis. In severe cases the nodules ulcerate and secondary infections can set in. ENL reactions are chronic and they usually re-occur.

Both types of reactions are treated with corticosteroids. A loading dose of 40 mg is given which is then tailed off slowly over a period of 3 - 6 months. Patients who are currently on MDT continue with the treatment till the full course is completed. Analgesics are provided to relieve pain.

1.6.2 Trophic ulcers

Ulcers are a common finding in people affected by leprosy when there is loss of sensation in the hands and feet. It is also known as trophic ulcers and is caused by injury (sometimes repeated) to the anaesthetic hands and feet. Ulcers develop in the affected parts as there is no pain sensation in the hands and feet as a result of the damaged nerves. Because there is no pain in the affected parts and also in the ulcers, patient continues to use his/her hands and feet without giving them a rest to allow the wound to heal properly. Ultimately, the ulcer gets infected and without proper care osteomylitis develops and the hands and feet become deformed as the bones get sequestrated.

1.7 Immunoprophylaxis

BCG has been shown to provide protection against leprosy ranging from 20 - 80 % depending upon the study population[15,16]. It provides protection against both PB and MB leprosy. BCG is one of the important vaccines given to infants in Myanmar as part of the childhood immunization programme. The National Leprosy Control Programme has advocated for its use as the BCG vaccination coverage is relatively high in the country. BCG certainly has an impact on reducing the incidence of leprosy but it is difficult to quantify because of other factors like socioeconomic development and MDT treatment may also contribute towards the decline in incidence.

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2. Changing Strategies: Specialized Control Programme, Integrated Control Programme, Elimination of Leprosy as a Public Health Problem and Reducing the Burden of Leprosy

Kyaw Lwin[I], Tin Myint[II], Tin Shwe[II], Kyaw Nyunt Sein[III],
Tin Maung Aye[II], Than Lwin Tun[IV], Oke Soe[V]

Leprosy at one time was a huge problem in all communities globally. As there was very little scientific understanding regarding the nature of the disease, patients were left on their own to try various kinds of remedies with very little or no effect. Apart from segregation, no other measures were available in hand to stop the spread of this dreadful disease until dapsone[1] was discovered for the treatment of leprosy.

2.1 Pre-independence period

During the period of the last Konebaung Dynasty of Myanmar and especially during the British colonial times leprosy had been well known to be endemic in the country. The origin and how leprosy spread throughout the country was not known but it was thought that invasion by the Chinese over the past centuries and the merchants and traders visiting the country from India could have brought along leprosy into the country. The earliest scientific record of leprosy prevalence in Myanmar was reported by the Leprosy Commission of India in 1890 - 91 in which the prevalence was estimated as 8.6 per 10,000 population for the whole country and 14.4 per 10,000 population in central Myanmar[2]. Leprosy was treated during that time using traditional medicines with very little success. Later during the colonial period, missionaries came to the country and established homes and shelters for leprosy patients and started providing care to them. These establishments provided a place of refuge to those who had nowhere to go. Chaulmoogra (hydnocarpus wightiana) oil and injections were used without much success. Basically, there was no effective treatment available during this period.

The strategy during this period was to isolate leprosy patients so as to limit its spread in the community. This strategy no doubt had its success in limiting the spread of the disease as observed in many Western countries but to what extent this occurred in Myanmar no one knows. However, this strategy also brought out the dark side of human behavior. Leprosy patients were feared and sent to live in colonies usually established in far away and isolated places. Often these patients were provided with inhumane living conditions. Patients were separated from their families and

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loved ones and stigmatized. The consequences of these measures are still felt in our society up to the present time.

Before gaining independence in 1947, the Government of Myanmar recognized leprosy as a national problem in the country and gave it priority in the health plan developed under the National Development Plan known as Serento Villa Plan[3].

2.2 Specialized Leprosy Control Programme (1950 - 1977)

After gaining independence in 1948, the Myanmar government having recognized leprosy as one of the major public health problems in the country established a specialized programme to control leprosy under the Health Department Plan number 9 in 1952. Its aim was to combat leprosy as an important public health problem[3]. By this time dapsone was discovered and it was recognized to be an effective anti-bacterial agent against M. leprae. With the availability of a tool to fight leprosy in hand, the government developed a strategy to treat leprosy patients domestically with dapsone orally on a mass scale throughout the country with assistance from WHO. Case finding and treatment with dapsone was the main strategy of the National Leprosy Control Programme.

Specialized categories of leprosy workers were recruited and treatment centers were opened in 27 districts in the country during the period 1952 to 1957[4]. A Central Leprosy Institute now known as Central Special Skin Clinic (CSSC) was established in 1952 located at the Rangoon General Hospital as a center to provide training for medical as well as paramedical workers. In addition, one out-patient leprosy clinic was opened by the government in Kemmindine Leprosy Home in Yangon that was run by the missionaries. WHO supported the Myanmar Leprosy Control Programme from its start with technical assistance, training, fellowships, research projects, monitoring and evaluation and funds for key programme activity.

Case finding and treatment with dapsone were the 2 main activities carried out by the specialized leprosy workers. Patients were provided treatment either at the treatment center attached to the civil hospital or at their place of residence (domiciliary treatment) without sending the patient to leprosy colonies. For those patients who face social problems and have no place to live, the government established leprosy colonies and provided housing and a monthly allowance for food. As a result of the above mentioned activities the number of leprosy cases undergoing treatment increased from 4,650 in 1952 to 35,200 cases in 1956[5].

It then became apparent that the problem of leprosy was much greater than what was then estimated. With the support from WHO and UNICEF the Health Department implemented 3 pilot projects during the years 1957 to 1958 with the objective to expand coverage of leprosy control activities in the country. These projects were carried out in Shwe Bo and Myin Gyan districts in Mandalay Region and Taung Gyi District in Shan State. Each project team was lead by a medical officer and the team members included various categories of paramedical workers such as leprosy inspector, junior leprosy worker, dresser, clerk, field assistant and laboratory technician. With the

experience gained from the pilot projects, similar projects were established to cover another 9 districts that represented the whole area of Central Myanmar known to be highly endemic areas for leprosy. This expansion of the programme was implemented during the period 1959 to 1961.

UNICEF made major contributions towards the programme from 1957 to 1986 and it was the sole supplier of dapsone and other supplementary drugs. It also supported programme activities by providing supplies and equipments such as motor vehicles, motorcycles, bicycles, laboratory equipments and supplies along with hospital and surgical equipments for reconstructive surgery and rehabilitation. The government expenditure for Leprosy Control Programme increased from around 97,000 Kyats in 1952 - 1953 to around 3,500,000 Kyats in 1977 - 1978 (inflation not factored in). The support from UNICEF was around USD 140,000 per year and from WHO it was around USD 200,000 - 300,000 for the bi-annum budget during the period 1960 to 1980.

In 1962, under the 5 year plan of the Health Department (1963 - 1969) further expansion of the programme was done and by the year 1969 the coverage of leprosy control activities reached throughout the whole country[6]. A total of 40 Leprosy Control Teams were formed to cover the whole country and each team was headed by a medical officer (Leprosy Team Leader) with 2 - 4 Leprosy Inspectors (LI) and 10 - 20 Junior Leprosy Workers (JLW). A laboratory was attached to each team along with a paramedical worker (dresser) to clean and treat the trophic ulcers and wounds.

Two referral clinics (centers of excellence) for leprosy treatment have been established by the Programme, one in Yangon (Central Special Skin Clinic) and the other in Mandalay (Mandalay Special Skin Clinic) General Hospitals. These clinics are the 2 main referral centers in the country and take care of treating complications (repeated ulcers and severe reactions), patients needing physiotherapy and those with drug sensitivity and resistance problems. These 2 referral centers also provide leprosy training to both under graduate and post graduate students from Yangon and Mandalay Medical Colleges. In addition, as these clinics have good laboratory facilities, they have become key research centers in the country.

2.3 Integrated Leprosy Control Programme (1978 - 1990)

The health administrative set-up was reorganized in 1965 and the Basic Health Services (BHS) was further strengthened. As the coverage of BHS improved, it was found that patients now have better access to the Rural Health Centers (RHC) than the 3 monthly household visits carried out by the specialized leprosy workers. The specialized leprosy worker's main job was to distribute dapsone on a 1 - 3 monthly basis depending on the case load in the assigned area and to carry out clinical assessments. Health Department experimented various models for integration of specialized disease control activities into the Basic Health Services (Primary Health Care Programme). Trials were carried out to find out the best model to integrate leprosy control activities into the BHS. Partial and total integration approaches were tried out in these trials. They were carried out in Hlegu, Magway, Taikkyi, Chaung Zone and Kyaukse Townships. Along with leprosy, other specialized disease control programmes such as malaria, trachoma and tuberculosis

programmes also participated in these trials. In the Kyaukse Trials that was carried out in 1973, two new categories of health workers were created: one at the supervisory level called Village Health Supervisor and the other at the implementation level called Village Health Worker. In the Chaung Zone trials (1974) midwives were trained to perform the tasks of multipurpose health workers.

Based on the positive outcome observed in these trials, a strategy to integrate specialized disease control activities into the Basic Health Care Services was initiated in 1978. The integration was implemented in a phase by phase manner. It was implemented under People's Health Plan I (1978 - 1982) and continued under People's Health Plan II (1982 - 1986). Under the People's Health Plan I a new category of health workers was created to be deployed at the township and rural health center levels. These health workers were called Public Health Supervisor Grade I and Grade II. These 2 categories of health workers were created based on the experience gained from the work of Village Health Supervisor and Village Health Worker employed in the Kyaukse integration trials. In addition to these 2 categories of health workers, specialized campaign staffs that were previously working as a single disease orientated worker were retrained to be general public health workers and given the tasks to deal with multiple diseases and health problems. They were then called Multipurpose Health Workers. However, as new sanctions especially for Public Health Supervisor grade II (PHS II) were not provided as planned in Rural Health Centers by the government the Multipurpose Health Workers had to carry out the functions of the PHS II in the field

In areas where there were no PHS II workers, the midwives stationed at the RHC under the supervision of Health Assistant were handed over the activities to treat leprosy patients and to maintain the treatment registers, in addition to carrying out case-finding activities and referring suspected cases to the leprosy control team. In the beginning, integration was fraught with problems such as reduction in the quality of care resulting in patients becoming non-compliant (defaulting treatment), poor recording and irregular reporting. In some instances there were instances of unwillingness on the part of the BHS staff to treat leprosy patients. These problems were overcome by showing a strong commitment for integration by the health administrators and repeated training given to the health workers to improve their skills and attitudes[6].

With integration, the manpower of the Leprosy Control Programme was reduced and nearly half of the field workers from the specialized programme were retrained and gradually transferred to the BHS as Multipurpose Health Workers. These ex-specialized leprosy workers were stationed at the RHCs and township health departments to carry out communicable disease control activities. By the year 1985, the integration process was completed in all the townships in the country.

2.4 Elimination of Leprosy as a Public Health Programme (1991 - 2005)

In 1982, WHO recommended a 3 drug combination treatment[7] that was called multidrug therapy (MDT) as a response to the global problem of dapsone resistance. This new treatment not only solved the problem of dapsone resistance but it also shortened the treatment duration by an average of 5 years.

The effectiveness of MDT brought about the launching of the strategy to Eliminate Leprosy as a Public Health Problem that is defined as a prevalence of less than 1 case per 10,000 population at the global level by the year 2000[8].

The strategy to eliminate leprosy as a public health problem was based on providing MDT treatment free to every leprosy patient in the world. MDT having much shorter treatment duration is expected to reduce the number of prevalence cases registered for treatment drastically in all leprosy endemic countries. In addition to increasing the availability of MDT drugs in endemic countries globally, intensive case finding activities called Leprosy Elimination Campaigns (LEC) were promoted on a large scale especially in highly leprosy endemic areas to detect new cases as much as possible. This activity greatly reduced the undetected cases (back-log cases) that exist in the community. The goal of elimination of leprosy as a public health problem was achieved in the year 2000 at the global level as targetted[9].

Myanmar achieved the goal of Elimination of Leprosy as a Public Health Problem at the national level (prevalence of less than one case per 10,000 population at the national level) in the year 2003[11].

After achieving the target of elimination of leprosy as a public health problem at the global level, WHO came up with a follow-up strategy called Final Push towards Elimination of Leprosy 2000-2005, aiming at achieving the elimination target at the national level in all leprosy endemic countries in the WHO Regions[10]. The National Programme continued its activities with the aim to achieve a prevalence of less than one case per 10,000 population at the state and divisional and also at township levels. Myanmar achieved the goal of Elimination of Leprosy as a Public Health Problem at the state and divisional levels in 2006.

2.5 Reducing the burden of leprosy (2006 - 2015)

With the number of prevalence cases reducing dramatically at all levels the Programme considered that it was time to give importance to reducing new case detections and also tackle the problem of disabilities occurring in leprosy affected persons. The Programme also became aware about the need to tackle the problem of stigma and discrimination. Myanmar adopted the WHO's strategy of Further Reducing the Leprosy Burden and Sustaining Leprosy Control Activities (2006 - 2010)[12] and focused its efforts on sustaining leprosy control activities and improving the quality of care by promoting disability prevention activities.

In 2010, Myanmar again adopted the WHO strategy of Enhanced Global Strategy for Further Reducing the Disease Burden due to Leprosy (2011 - 2015) and targeted its activities to reduce grade 2 disabilities among new cases[13]. This strategy aims to detect new cases at an early stage (without visible disabilities) in order to reduce transmission in the community. This strategy's target is to reduce the rate of new leprosy cases with severe disabilities (visible disabilities) at the time of diagnosis by a factor of one-third. By reducing the number of leprosy cases with visible disabilities it is hoped that stigma and discrimination in the community will also be reduced as

patients can be cured without having any residual effects of the disease.

Early case-finding and treatment continues to be the main activity of the Programme. Active case-finding activities that were carried out are: mass village surveys, household contact examinations of new cases and leprosy awareness campaigns. In addition, prevention of disabilities (POD) activities were implemented in high leprosy burden townships. Training and POD kits were provided to health workers in the selected townships.

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3. Technical and operational guideline changes made in response to challenges: clinical presentations, diagnosis, classification, chemotherapy, case-finding and disability grading

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Looking back at the history of leprosy control in Myanmar from its launch in the early nineteen fifties up to present time, it is evident that operational and technical changes were made in response to challenges faced by the Programme in carrying out control activities in the field Changes were also made as knowledge about the disease improved and based on these scientific developments new strategies and guidelines were developed. The goal of these changes is to improve the effectiveness of leprosy control programmes' activities in the field and to ensure that patient receives the best treatment and care.

3.1 Clinical presentations: changes observed during pre-dapsone, dapsone and MDT era

During pre-dapsone era basically there was no effective treatment for leprosy and the bacilli went unchallenged. Over a period of time it attacked all most all organs in the body. However, damage was especially seen in the nerves, bones and cartilages. Almost all patients ultimately ended up with severe skin lesions that manifested as large reddish plaques, infilt ations and nodules on the face, ear lobes, extremities and body[1]. In addition, as a result of damages to the nerves and bones (bone resorption and osteomylitis) leprosy-affected person developed disfigurement and deformities in the face and extremities as the disease progresses. Such patients ultimately presented with one or more of the following conditions: lagopthalmus, saddle nose, facial palsy, blindness, claw hands and feet, wrist drop, foot drop and trophic ulcers.

However, with the discovery of dapsone in the mid-forties an effective treatment for leprosy became a reality and it gave hope to patients all over the world. Establishment of leprosy control

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programmes in endemic areas improved accessibility to treatment and in return this promoted early case detection. Individuals with suspected leprosy skin lesions came forward for treatment at a much early stage. The above mentioned factors greatly contributed to the changes observed in the clinical presentation at the time of diagnosis. Patients started to present more with simple skin lesions that are either single or multiple.

When dapsone was introduced in Myanmar there were already a huge number of undiagnosed (back-log) cases in the community and most of these cases were already in the late stages (more than 10 years) of the disease. Cases during this period were presenting with signs of nerve damage (hard and enlarged peripheral nerves such as supra-orbital, posterior auricular, radial, ulnar, lateral popliteal and posterior tibial) along with signs and symptoms of damage to the muscles supplied by these nerves. Nerve damage results in weakness and atrophy of the muscles leading to wrist and foot drop[2]. Loss of eye brows, saddle nose, thickened ear lobes, nodular skin lesions, gynaecomastia, shortening of the fingers and toes due to bone resorption and claw hands were very common findings at the time of diagnosis among new cases at the time of launching of the Programme.

As the programme increased its treatment coverage with dapsone and the awareness about the disease also improved, more and more of the back-log cases were slowly cleared. The Programme also gave importance to both active and passive case-finding activities. As such the clinical presentations at the time of diagnosis started to change. Majority of new cases presented with only skin lesions and severe forms of clinical presentations were seen less and less.

With the introduction of MDT in Myanmar in 1986, treatment became more effective and shorter. Certain types of patients need not take life-long treatment as in the case during the times of treatment with dapsone monotherapy. A cure for leprosy became a reality and people became less afraid of the disease due to the availability of an effective treatment. This resulted in more individuals with suspected skin lesions coming forward for screening and cases were diagnosed at a much early stage of the disease than in the days of dapsone. Most patients presented with just skin lesions. Cases would be rarely coming forward with late manifestations of the disease and nerve damage which was quite a common thing during dapsone monotherapy days. In addition, signs and symptoms of the disease abated at a much faster rate with MDT compared to that observed during dapsone monotherapy treatment. Clinical improvements were seen within a few months of starting MDT treatment which again was an encouraging factor for patients and motivated them to take treatment regularly.

3.2 Simplifying diagnosis: from clinical signs supported by strong laboratory evidence to clinical signs with or without laboratory evidence

Leprosy is a disease that has been so dreaded by people over the past centuries that individuals with other skin lesions on many occasions have been labeled wrongly as suffering from leprosy. This occurred more so with individuals developing deformities resembling those seen in leprosy patients. Such instances of wrong diagnosis happened in the past as clinical features of leprosy were not well understood.

Even now, in spite of all the advances in medical science, the diagnosis of leprosy is still mainly based on clinic signs and symptoms especially in the very early stage of the disease. No specific test for diagnosis of leprosy has been discovered as yet. Polymerase Chain Reaction (PCR) and Phenolic Glycolipid 1 (PGL1) tests do not have high enough sensitivity and specificity for these tests to be recommended for routine use in the field Slit-skin smear and skin biopsy examinations are the only 2 laboratory tests available in hand to help in the diagnosis of a case of leprosy. Even then, their sensitivity is not high enough to help detect all true leprosy cases.

Myanmar Leprosy Control Programme since the time it was established worked very closely with the World Health Organization and received technical support all along to improve its control activities. WHO's recommendations[3] were adapted to suit local conditions and were used in the Programme. As such, the criteria for diagnosis of leprosy used by the Progamme changed from time to time. Such changes were made with the sole intention to make it easy for the paramedical field orkers to diagnose a case of leprosy and provide treatment timely.

During the 1950s, the diagnosis of leprosy was mainly done by physicians and majority of them were leprologists or dermatologists. All suspected cases were subjected to skin smears taken from several areas of the body and in some specialized centers biopsies were also taken to confi m the diagnosis. In addition, lepromin test was done to measure cell mediated immunity of the patient to help in the classification As there were very few clinics where such services can be offered, this limited the accessibility to diagnosis and treatment. With the launch of the Leprosy Control Progamme, this constraint was noted and to overcome this problem training was given to paramedical health workers so that they are able to diagnose a case of leprosy and treat. The Programme was launched as a public health programme and the key workers are the para-medical health workers (leprosy inspectors and junior leprosy workers). These health workers underwent a 6 months training course in order for them to be well trained in leprosy control activities. At the village level they are responsible for diagnosis (able to take slit skin smears), treatment, finding new cases, health education, treatment of minor complications and disability prevention.

Based on the recommendations of the Sixth Report (1998) of the WHO Expert Committee on Leprosy the Myanmar Leprosy Control Programme stopped the compulsory requirement of taking slit skin smears from all suspected cases for the diagnosis of leprosy. This allowed cases to be diagnosed solely based on clinical signs without the need for bacteriological tests. It simplified the diagnosis of leprosy and made it easy for non-specialized health workers from the Basic Health Services to be able to diagnosis a case of leprosy.

3.3 Classification: simplifying for control activities

Even before any treatment for leprosy was discovered the first recorded history of classification of leprosy was done in 1848[4] in which leprosy was classified into 2 types. One was nodular (characterized by nodular skin lesions and nerve lesions) and the other was anaesthetic

(characterized by nerve lesions). In the Report of the Leprosy Commission in India 1890 - 1891[5] leprosy in Burma was classified into 3 types namely, Tuberculiod (nodular), Anaesthetic and Mixed.

Leprosy, unlike any other infectious disease had a long history of categorizing various clinical presentations into groups and to classify them as different types of leprosy. This was done not for the purpose of diagnosis but for treatment. The basic concept of classification is to provide more potent bactericidal or bacteriostatic drugs and to provide a much longer treatment for certain group of patients that have high bacilli load in the body.

3.3.1 Pan American and Madrid classification

The Second Pan American Leprosy Congress held in Rio de Janeiro in 1946 adopted the classification of leprosy into 3 types namely lepromatous, tuberculoid and uncharacteristic[6].

This classification along with subsequent changes made to it was reviewed at the International Leprosy Congress in Madrid in 1953 and a new classification was recommended[7]. Leprosy was thereby classified into Lepromatous (L), Tuberculoid Type (T), Borderline (B) and Indeterminate (I).

3.3.2 Classification of Myanmar National Programme: Indeterminate, Tuberculoid and Lepromatous (ITL)

Myanmar National Programme modified the above mentioned Madrid Classification for use in the field by classifying leprosy into just 3 types. These were Indeterminate (I), Tuberculoid (T) and Lepromatous (L). Those cases belonging to borderline type in the Madrid classification were grouped together with Lepromatous type. This made it easy for the paramedical field workers to classify leprosy.

Later in the mid-sixties, the National Programme changed the classification of leprosy into 5 types namely, Intederminate, Tuberculoid, Lepromatous, Borderline and Uncharacteristic and introduced it in the training curriculum for medical officer and para-medical health workers. However, as this classification was difficult especially for reporting purposes the National Programme reverted back to the much more simple classification of Indeterminate (I), Tuberculoid (T) and Lepromatous (L) in the early seventies.

3.3.3 Ridley and Jopling classification

In 1966, Ridley and Jobling developed a new classification based on clinical, bacteriological, immunological and histological finding [8]. At one polar end was the classification of Tuberculoid (TT) and at the other end it was Lepromatous (LL). Between these 2 polar types 3 more types were identified They are: borderline-tuberculoid (BT), in the middle was Borderline (BB) and nearer to the Lepromatous end was Borderline-Lepromatous (BL). Thus this classification abolished indeterminate type form the Madrid classification It only had TT, BT, BB, BL and LL types.

The national programme used this classification for research purposes only as it was not possible to carry out bacteriological or histological tests on all new cases especially under field conditions.

3.3.4 Paucibacillary (PB) and Multibacillary (MB) classification

Along with the recommendations for MDT, the WHO Study Group on Chemotherapy[9] in 1981 classified patients as multibicillary (MB) or paucibacillary (PB) leprosy according to the degree of skin smear positivity. The main reason for having to introduce this classification was to make it possible to give a longer and more potent treatment to patients with high loads of bacilli in the body.

It grouped lepromatous (LL), borderline lepromatous (BL), mid-borderline (BB) types classified in the Ridley-Jopling classification with a slit-skin smear bacteriological index (BI) of 2 and above at any site at the time of diagnosis, as MB. Intermediate (I) and polar tuberculoid (TT) and borderline tuberculoid (BT) in the Ridley-Jopling classification with a slit-skin smear bacteriological index (BI) of less than 2 at any site at the time of diagnosis were classified as P .

With the above mentioned classification, it was still difficult to classify leprosy in the field as the cut off point for PB and MB was BI of 2. This classification requires that there is a good laboratory that can support the field worker in classification The accuracy of the skin smear result depends not only on the reliability of the laboratory but also on the quality of the skin smears taken by the workers in the field The WHO Expert Committee on Leprosy, Sixth Report[10] in 1988 recommended that any case with a positive skin smear (regardless of the BI level) is to be classified as MB. If the skin smear results are doubtful, the patient should be classified as MB. The National Leprosy Control Programme adopted this recommendation and used this in the field, which made it easier to classify and treat patients.

The classification of leprosy was further simplified in 1998 at the Seventh Expert Committee on Leprosy[11] meeting. It recommended skin smear test to be optional. This made classification much simpler for the field workers who usually do not have support from a good laboratory to process slit-skin smear tests. The classification into PB and MB was done based on counting the number of skin lesions. The following 3 types of leprosy were classified

- Paucibacillary single-lesion leprosy (one skin lesion)
- Paucibacillary leprosy (2 - 5 skin lesions)
- Multibacillary leprsoy (more than 5 skin lesions)

However, The National Programme only used PB (1 - 5 skin lesions) and MB (6 and above) classification since it did not use the 3 drug combination of rifampicin, ofl xacin and minocycline (ROM) treatment for single-lesion leprosy in the programme.

3.4 Chemotherapy: changes made to improve and simplify treatment

3.4.1 Dapsone monotherapy

When dapsone (diamino-diphenlysulfone also known as DDS) was first introduced to treat leprosy, physicians were afraid to use it without close supervision because it was widely believed at that time that dapsone can precipitate reactions. When starting dapsone treatment, WHO recommended that the treatment be started with small doses and gradually increased with caution until maximum dose of 600 mg per week is reached. Dapsone was given to patients starting with a low dose of 25 mg daily and it was then gradually increased by 25 mg at 4 weekly intervals until the maximum dose of 100 mg was attained[12].

The National Programme adapted this recommendation and to suit local conditions developed guidelines to increase the dose by 25 mg at 3 monthly intervals as the leprosy worker (junior leprosy worker) visited patients at 3 monthly intervals to deliver dapsone on a domiciliary basis in the field It took almost a year for the patient to receive the optimal therapeutic dose of 100 mg daily if all goes well. If the patient complains of reaction or any side-effect such as weakness or dizziness, the dosage was either reduced or maintained at the same level for another 3 months before starting the process of increasing the dosage again. Because of this cautious approach, sometime patients took almost 2 - 3 years to receive the required 100 mg daily dose of dapsone. The problems associated with drug supply logistics that involved ordering and distribution of dapsone tablets in various dosages created huge problems in the field In the case of patient with severe reactions dapsone treatment was stopped and an alternative drug thiambutosine (Ciba 1906) was given and only after the reactions have subsided this drug was withdrawn and dapsone was reintroduced.

As more experience was gained in using dapsone, it was found that patients can safely be given straight away a daily dose 100 mg from day one of treatment. This change in the treatment regimen was made in the mid seventies. It simplified treatment both for the patient as well as for the health worker especially in the case of the Myanmar Leprosy Control Programme that provides domiciliary treatment.

Treatment with dapsone was at first given life-long for all types of leprosy cases. However, it was later discovered that for patients with negative skin smears, dapsone treatment can be stopped after 5 - 10 years. Patients were treated with dapsone until the lesions in the skin and nerves reached a stage of inactivity, after which tuberculoid cases were treated for additional 2 years, indeterminate cases for 3 years and lepromatous and borderline cases for 10 years[13]. This activity was called release from treatment (RFT) and it was initiated in 1973. However, the effectiveness of dapsone treatment was not uniform and relapses occurred in some cases even after taking 5 - 10 years of treatment. In India, the relapse rate was 3.22% per year after 6 years of follow-up[14]. This made the Programme to be cautious when stopping dapsone treatment. Only medical officers were given the authority to stop treatment. Patients for whom the treatment was stopped were not

told that they have been cured but were told that they have been released from treatment (RFC). Such cases were followed up yearly for signs of relapse or told to report back to the Programme when suspicious lesions appear. Cases were put on the RFT register and followed-up for 3 years. For patients that are intolerant to dapsone an alternative drug recommended is thiambutosine. This drug is started at a dose of 0.5 gm a day and gradually increased to 1.5 gm a day. However, it was also recommended that this drug should not be continued beyond 2 years as its activity diminishes, which is probably due to drug resistance[12].

Resistance to dapsone started to appear in Myanmar in early seventies after having used this drug for around 20 years in the fiel [15]. The chances for M. leprae becoming resistant to dapsone increased especially as it was used as a monotherapy treatment for long periods of time. The chances of developing resistance were further increased due to poor treatment compliance on the part of patients because of the long treatment duration. Patients for various reasons were unable to take their self administered daily dapsone regularly. At the time of using dapsone on a mass scale there was little knowledge about drug resistance and even if one would have liked to add another drug there was none readily available that the Programme could afford. Dapsone that was distributed by the Programme was provided by UNICEF and the funds to purchase other second line drugs were limited. The drug supply situation became critical in early 1980s when UNICEF started to shift its focus away from leprosy and started to phase out its support for leprosy control activities in Myanmar. The National Programme had to find other donors or the supply of drugs.

3.4.2 Introducing rifampicin treatment for lepromatous and borderline types of leprosy

The National Programme carried out a trial from 1976 to 1984 in Singu Township of Mandalay Region[16] to identify all potentially infectious leprosy patients in Singu Township and to give them supplementary supervised treatment with rifampicin, with the aim to render them non-infectious. Rifampicin has been proven to be a very powerful bacteriocidal drug against M. leprae. In this trial, rifampicin 600 mg daily was given to all lepromatous cases for 30 days in addition to dapsone 100 mg daily. Cases suspected of having dapsone resistance were given clofazimine 100 mg daily in addition to the above mentioned 2 drugs. In addition, an annual single dose of 1,500 mg of rifampicin was given to all the cases as a follow-up treatment to supplement the daily 100 mg dapsone treatment. At the end of 2 years follow-up, all cases showed clinical improvements. At 5 years follow-up, 12 out of 271 cases (4.4%) showed evidence of reactivation. In the study area the incidence of lepromatous leprosy also declined from 4.9 cases per 1,000 population to 0.9 cases per 1,000 population at the end of the study in 1983 - 1984.

The results obtained from the rifampicin trials in Singu encouraged the National Programme to introduce rifampicin along with dapsone to treat lepromatous (including borderline) type of leprosy cases in the country in 1984. Supervised treatment of rifampicin 1,200 mg single dose was given monthly for 6 months by the specialized leprosy workers along with 100 mg dapsone

daily self administered treatment. This treatment was followed up with a single annual dose of rifampicin 1,500 mg[17]. The remaining tuberculiod and indeterminate types of leprosy were treated with dapsone 100 mg daily as before because secondary dapsone resistance was not observed in them.

Rifampicin was provided by UNICEF as a special assistance to the Programme. The above mentioned treatment regimen was used by the National Programme from 1982 to 1986 in the 6 hyper endemic regions in the country ((Sagaing, Mandalay, Magwe, Bago, Shan and Irrawaddy Regions). In the remaining Regions, the Basic Health Services continued to provide dapsone monotherapy as an integrated programme. The situation of primary dapsone resistance was not known at that time.

3.4.3 Multi Drug Therapy (MDT)

By the early seventies, leprosy control programmes all over the world were faced with the problem of secondary dapsone resistance. The success achieved in controlling the disease as of now was at risk. Reports of secondary dapsone resistance to be as high as 19% among cases previously treated with dapsone were observed in some parts of the world. However, more alarming was the report of low levels of primary dapsone resistance of up to 50% among newly diagnosed and previously untreated cases[9].

Based on the study carried out in Myingyan District in Myanmar during 1980 to 1983, dapsone resistant rate was found to be 38.6% among lepromatous cases treated with dapsone for more than 5 years. The annual incidence rate of secondary dapsone resistance was 3.8% among lepromatous cases[16].

The possibility of secondary dapsone resistance occurring in Myanmar was also highlighted in the 1973 WHO Assessment Report[18] to be around 24 - 27% of lepromatous and borderline leprosy cases as they were found to be having solid staining bacilli in their skin smears. Solid staining bacilli were regarded to be still viable (can be grown in mouse foot pads).

The seriousness of drug resistance problem occurring globally led WHO to convene a Study Group on Chemotherapy of leprosy in 1981. After reviewing various data that was available at that time, the Study Group recommended multidrug therapy (MDT) to replace dapsone monotherapy treatment. It recommended that paucibacillary (PB) cases be treated with rifampicin and dapsone for 6 months and multibacillary (MB) cases be treated with rifampicin, clofazimine and dapsone for 24 months or until skin smears becomes negative[9]. This meant that patients with high bacillary loads (skin smears highly positive) will have to take MDT for around 4 - 5 years. At first there was great skepticism and outright condemnation with regards to this recommendation but as the effectiveness of MDT became obvious, more and more national programmes started to use it and finally it became the standard first line treatment or leprosy globally.

During the People's Health Plan II period of 1982 - 1986, the National Programme carried out an initiative to clean the treatment registers and to discharge patients (release from control) who have been treated sufficiently with dapsone monotherapy and who have inactive skin lesions and do not need treatment anymore. Defaulters were retraced and the treatment registers that are in the hands of the BHS were updated. By the end of 1987, a cumulative total of 61,587 cases were released from control[19].

Myanmar introduced WHO recommended MDT in 1986 in 6 hyper-endemic regions in the country (Sagaing, Mandalay, Magwe, Bago, Shan and Irrawaddy Regions). MDT drugs were provided by Sasakawa Memorial Health Foundation through WHO. At the time of introducing MDT there were about 222,000 cases registered for treatment in the country with a prevalence rate of 59.2 per 10,000 population. MDT was provided by specialized leprosy staff as domiciliary treatment. The case load in these 6 regions represented 85% of the total case load in the country. Each township was divided into 3 areas and MDT was introduced in a phase by phase manner in each area. Health workers visited villages and delivered the MDT monthly to patient as the recommendation was that the 600 mg rifampicin dose is to be given under supervision. This requirement created a lot of operational problems when expanding treatment into the next area as some MB cases from the first area are still under MDT treatment and at the same time new cases were occurring in this area which makes the move to the next area difficult because of the work load. The national guideline was to treat MB cases till skin smears become negative. MB cases were treated for at least 24 months or sometimes even for longer duration because their skin smears are still positive. In 1988, the National Programme at the suggestion of WHO consultant, adopted the 2 year fi ed duration treatment of MDT for MB cases based on operational grounds as the MDT expansion activities were almost coming to a standstill. At the end of 1989, MDT coverage in Myanmar was 55.4%. By 1990, MDT was introduced in 167 townships (out of 315 townships in the country) and around 53,000 cases were treated successfully[3].

At the end of 1990, human resources needed to provide monthly supervised rifampicin treatment in a domiciliary treatment programme made expansion of MDT treatment to other Regions in the country impossible, especially if the National leprosy Control Programme continues to use only its own staff. The leprosy situation at that time was favorable for integration of MDT treatment as the case load has declined in each areaand it has reached a stage where it can be managed by the Basic Health Service (BHS) at the village level. BHS infrastructure has become strong and its coverage was good. In addition, because MDT treatment is simple to deliver and has very little side-effects the National Programme with the aim to expand MDT coverage nation-wide integrated MDT treatment into the daily activities of the BHS in 1991. The midwives were the main peripheral health workers at the village level that were responsibility for case-finding and treatment with MDT[20]. The specialized leprosy control staff took the role of supervisors and provided technical assistant to BHS.

In 1993, WHO Study Group on Chemotherapy of Leprosy issued a recommendation that reduced the duration of treatment for MB cases to 24 months (fi ed duration) regardless of the skin smears results at the time of completing 24 monthly doses of MDT[12]. Duration of treatment for PB cases and the composition of MDT drugs for both PB and MB leprosy were left unchanged. This made it simple for field workers to stop treatment for MB patients upon completion of 24 monthly doses of MDT treatment as it does not have to rely on skin smear results. It not only reduced the costs of treatment but also encouraged patients to comply with the treatment as the duration of treatment was short.

With the launching of the initiative to Eliminate Leprosy as a Public Health Problem globally in 1991, The Nippon Foundation in 1994 and later the Novartis Foundation for Sustainable Development donated MDT drugs in blister pack form to WHO for distribution to all endemic countries at no cost. With a guaranteed supply of MDT drugs, the National Programme launched an intensive plan to expand MDT coverage in the country. This intensive activity to expand MDT coverage in Myanmar was started in 1995 and in 1998 it attained 100% coverage[21].

Again in 1998, with the aim to further simplify treatment the Seventh Expert Committee on Leprosy[11] after reviewing the relapse rates after completion of MDT treatment issued a recommendation that the duration of the current MDT regimen for MB could be shortened further to 12 months. The National Programme adopted this recommendation as it made MDT treatment more attractive to the patient. The current relapse rates after completion of MDT treatment for both PB and MB patients are low[22].

In 2000, WHO recommended that the monthly dose of 600 mg rifampicin that is to be given under supervision once a month to both PB and MB patients can be done by a family member or a person living close to the patient[23]. This fl xible treatment of MDT was known as Accompanied MDT (A-MDT). This was a very practical recommendation especially for patients residing in remote areas where communication is poor and health workers can't visit the patient to carry out defaulter tracing. Taking into consideration the patient's inability to come to the health center for the monthly supervised treatment, it allowed the health worker to provide more than a month's supply of MDT to the patient provided that there is a person from the family or community who is willing to supervise the monthly dose of rifampicin treatment. Under certain conditions, a full course of treatment was even provided to the patient if necessary.

The introduction of MDT changed the situation of leprosy in Myanmar dramatically. Patients are now being treated with the best drugs available in the world for leprosy treatment. Clinical response to treatment was seen quickly (within months) and the duration of treatment was short (maximum 12 months). Finally, at the end of completing the recommended MDT treatment course the patient can be told that the disease has been cured. This was a great improvement from the days of dapsone monotherapy when the word cured was not used (release from treatment was used) due to fear of relapse. In addition, MDT solved the problem of dapsone resistance.

3.4.4 Single dose treatment of Rifampicin, Ofloxacin and Minocycline (ROM) for single skin lesions

Research carried out in the area of chemotherapy showed that minocycline 100mg and ofl xacin 400mg single does treatment was almost as good as single dose rifampicin 600mg treatment in killing *M. leprae*. As such, to make the treatment of single skin lesion leprosy cases simple and short the WHO Expert Committee on Leprosy[11] in 1998 considered that a single dose treatment of rifampicin, ofl xacin and minocycline (ROM) as an acceptable and cost-effective alternative regimen for patients with single skin lesion leprosy.

Myanmar adopted this recommendation but introduced this treatment only in selected treatment facilities on a trial basis to explore the operational feasibility of this treatment.

3.5 Case-finding: changes in the case-finding mode

Case-finding is one of the most important activities in leprosy control. Detecting cases at an early stage of the disease means that patient gets treatment early and the disease process is arrested. It prevents further destruction of tissues and organs in the body. Ultimately, it prevents the development of disabilities.

In addition, another important impact of case-detection is that as new cases are brought under treatment it reduces the pool (source) of infection in the community (secondary prevention). Treatment either with dapsone or MDT reduces the bacilli load in the patient.

3.5.1 Active case-finding

Since the launch of the Leprosy Control Programme in Myanmar, case-finding activities have been one of the major activities in the Programme. Active case-finding activities include: household contact examinations, school surveys, screening of workers in certain industry and most importantly, mass village surveys. Household contact screening and primary school surveys are carried out by Junior Leprosy Workers (JLWs) in their assigned areas annually. Screening of workers in certain industries and mass village surveys were carried out by the township leprosy control team as more human resources are needed for the activity. These active surveys are time consuming and costly as it requires time for preparation and screening.

In a retrospective study carried out in Hmawbi Township, out of 320 new cases detected during 1964 - 1974 the proportion of new cases detected by means of school survey was 9.7%, contact examination contributed 18.4% and mass village survey contributed 18.4%. The total proportion of new cases detected through above mentioned active methods was 46.5%[24].

The proportion of new cases detected through active method gradually declined and in 1985 when leprosy control actives were integrated into the Basic Health Care System (primary health care system), only 16% were detected through active case-finding means out of a total of 6,600 new cases detected [25].

By the end of 1989 with MDT coverage around 54% in the six hyper-endemic regions in the country, the total number of new cases detected in the country during that year was 6,496 cases[26]. However, only 18% of the total new cases were detected through active case-finding methods. With the launching of the Elimination of Leprosy as a Public Health Problem strategy in Myanmar along with expansion of MDT treatment coverage, active case finding was promoted with support from WHO. These activities were called Leprosy Elimination Campaigns (LEC) and Special Action Project for Elimination of Leprosy (SAPEL)[27]. LECs were carried out in high endemic areas (118 townships) in the country with the objective to find as many new cases as possible. SAPEL was carried out in underserved areas (6 townships) with the objective to reach out to patients who do not have access to MDT treatment because of poor health care coverage. In addition, the National Programme carried out a Nation-wide Leprosy Elimination Campaign (NLEC) in 1999 covering 320 townships[3].

As shown in Table 1, more than 30,000 new cases were detected during the 3 year period of 1997 to 1999[28] as a result of active case-finding The above mentioned extensive country-wide case finding activities were able to detect a large number of new cases and it was able to clear the pool of undetected cases (back-log or hidden cases) existing in the community. By providing MDT to all new cases detected during the Campaigns it was able to reduce the source of infection in the community and indirectly contributed towards the reduction in transmission. The long term expectation is to see a reduction in the number of new cases detected yearly. Currently, active case finding methods used in the Programme are mass village surveys, household contact surveys and leprosy awareness campaigns (in high endemic villages).

Table 1. Number of new cases detected by Leprosy Elimination Campaigns (LEC), Special Action Projects for Elimination of Leprosy (SAPEL) and NLEC

Year	LEC	SAPEL	NLEC	Total
1997 - 1998	7 457	-	-	7 457
1998 - 1999	8 178	214	-	8 392
1999	-	-	14 594	14 594
Total	15 635	214	14 594	30 443

Source: Progress towards leprosy elimination in Myanmar 1952 - 2002.
Leprosy Control Programme, Department of Health, Ministry of Health, 2002.

3.5.2 Passive case-finding

Passive case-finding in leprosy usually means self referral as well as all other referrals from various health clinics (general OPD clinics). Self referral is being promoted by the Programme by providing information about leprosy to the public through health talks and distribution of printed information materials. During the early sixties and mid seventies, the only mass media available to the Programme was radio talk. After the launching of the National TV in the late seventies, National

Programme in collaboration with the Health Education Bureau of the Department of Health started producing TV spots and educational film , as the importance of using mass media to educate the public was understood. The proportion of new cases detected by means of passive case-finding method (self and referrals from other health clinics) was around 54%[26].

With the launching of the initiative to Eliminate Leprosy as a Public Health Problem in Myanmar, the use of electronic media for educational purposes was increased. Several TV spots and documentary movies were made to educate the public about leprosy.

However, as active case-finding requires large amounts of funds, LEC and SAPEL activities could not be sustained after achieving the target of elimination of leprosy as a public health problem. The Programme currently relies more on passive case finding Out of a total of 3,113 new cases detected during 2012, 82% were detected through passive means and only 18% of the new cases were detected though active means[29].

3.6 Disability grading: simplifying the grading scheme

Leprosy is dreaded because it causes severe disfigurement and disabilities. Prevention of disabilities is an important activity in every leprosy control progrmme. However, the best way to prevent disabilities is to detect new cases at an early stage before disabilities have set in. Another way is to prevent disabilities that already exist in the patient at the time of diagnosis from getting worse.

To understand the magnitude of the problem of disabilities and to plan for services that aims to reduce disabilities, the National Programme adopted a scheme to measure disabilities caused by leprosy. The grading method was based on assessing eyes, hands and feet. It is basically a rough measurement for use in the field to get an idea of how advanced the disease process is at the time of diagnosis and to monitor if the disability is progressing because of improper care during and after treatment. This grading of disabilities does not reflect or measure the s verity of the disability.

Grade 1 disabilities include conjunctivitis and loss of sensation in the hands and feet. Grade 2 includes iritis, blurring of vision and lagopthalmus in the eyes. Ulcers, mobile claw hands and slight bone resorption in the fingers and ulcers, foot drop, clawed toes and slight bone resorption in the toes. Grade 3 comprises fi ed claw hands and feet, severe bone resorption, wrist drop, saddle nose and blindness. This grading system is complex and is subject to misclassification especially when the field orkers are not properly trained.

To further simplify disability classification, the National Programme adopted the recommendations of the WHO Expert Committee on Leprosy[30] in 1988 (Sixth Report) and simplified the disability grading scheme into 0, 1 and 2. Grade 0 means no visible deformity or damage and Grade 1 includes loss of sensation (anaesthesia) in hands and feet. All visible deformity or damage either in the eyes, face, hands and feet are categorized as Grade 2 disabilities. This made classification of disabilities simple and the chances of misclassification as greatly reduced.

3.7 Release from control (discharge from treatment)

During the days of dapsone monotherapy treatment patients were usually treated for life as the criteria set to stop treatment was very rigid and left in the hands of leprosy experts. In some instances, a skin biopsy had to be taken. Fear of patient relapsing was great in those days. This lead to strengthening of the belief that leprosy is an incurable disease. However, in 1966 WHO Expert Committee on Leprosy recommended that patients on dapsone treatment should become inactive first (no active clinical signs and skin smears are negative) after which addition treatment with dapsone is to be given for one and a half years for tuberculoid cases, 3 years for indeterminate cases and 5 years for lepromatous cases before they can be discharged from treatment, also called release from treatment[31] (RFC).

Determining when the patient has reached the inactive stage created problems in the field as patients cannot be reviewed annually on a regular basis by the Team Leader. This resulted in a situation where most cases are unable to fulfill the criteria for discharge. Later, it was found that indeterminate and tuberculoid types of leprosy cases can be discharged after 5 years of regular treatment with dapsone[32].

Following recommendations from WHO consultant in 1973, the National Programme developed guidelines that are more applicable to the National Programme for RFC. Indeterminate and tuberculoid types of leprosy receiving 6 years of treatment with dapsone with no active signs for past 3 years were allowed to be RFC. Team Leaders from the Leprosy Control Programme at the district levels were given the authority to carry out this task. As a result of this activity, around 2,000 to 3,000 patient were released from treatment each year[33].

In 1980, WHO recommended that tuberculiod patients without signs of clinical activity and with negative bacteriological findings can be released from control provided that they have been regularly treated with dapsone for a minimum of 5 years[34].

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4. Rehabilitation: Institutional services to community based approach

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People dread leprosy mainly because it causes disfigurement which can be very severe especially during the days when there was no treatment. In pre-dapsone days, almost all individuals who came down with the disease finally ended up with some form of disability. Treatment with dapsone prevented millions of patients from developing disabilities. This was more obvious after the introduction of MDT. However, patients are still developing impairments and disabilities. This is due to delays in seeking treatment or due to reactions developing during or after completion of MDT treatment. Globally, around 4,000 new cases are detected each year with grade 2 disabilities[1]. Grade 2 disabilities are defined as any visible deformity or damage occurring in the face, upper and lower extremities in a person affected by leprosy.

The National Programme carried out activities to prevent disabilities occurring as a consequence of complications and provided appropriate treatment and care to patients who are in need. It also provided surgical as well as social rehabilitation services for persons affected by leprosy to the best of its ability and available resources. In spite of its efforts to provide rehabilitation services, this component of the leprosy control activities has always been weak for reasons such as lack of resources, complex social problems and persisting stigma and discrimination in the community.

4.1 Leprosy colonies

Before the Second World War, the Burma Branch of the British Empire Leprosy Relief Association (now known as LEPRA Health in Action) provided a grant to establish District Leprosy Associations. With that grant, leprosy colonies were built by the respective associations in 9 Districts. In addition, 2 leprosy colonies were also run by the Shan State Government in Lashio and Maing Tauk Village in Inlay area.

With the launching of the Leprosy Control Programme in the early fifties after the country's independence, in addition to the 11 existing colonies 5 more colonies were established making

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it a total of 16 colonies throughout the country to accommodate leprosy patients with severe disabilities and for those who faced severe economic and social problems due to discrimination. Admission into these colonies was not compulsory. These colonies were administered under the District Leprosy Relief Association. The District Leprosy Relief Association was registered as a charitable association and headed by the Deputy Commissioner of the District. Members of this association had to pay a subscription of 5 Kyats annually. Each colony accommodated around 50 to 100 patients.

At the central level, the Union of Burma Leprosy Relief Association was established which was the successor to the British Empire Leprosy Relief Association. The President of the Union of Burma was the patron and the Minister of Health was the chairperson. The Director of Health Services and the Assistant Director of Leprosy acted as secretaries along with the Manager of the State Bank of India acting as treasurer and took care of accounts. After independence, another association called the British Empire Leprosy and Tuberculosis Association was closed and some funds from this association were transferred into the Union of Burma Leprosy Relief Association. This Association supported the District Leprosy Relief Associations with funds to help run the leprosy colonies. Both these associations worked closely with the National Leprosy Control Programme and provided funds to help establish offices or new leprosy control teams in the districts.

By 1963, there were 3,681 people affected by leprosy living in these colonies amounting to 1.5% of the total case load in the country. Patients were provided living accommodations and a monthly allowance of 20 Kyats for food, half of which was provided by the District Council and the other half from the central government budget. All patients admitted to these colonies received treatment with dapsone.

However, in 1963 all associations and organizations in the country were dismantled by the Revolutionary Council of the Union of Burma and under this order both the Union of Burma Leprosy Relief Association and the District Leprosy Relief Associations ceased to exit. The funds remaining in the Union of Burma Leprosy Relief Association were donated for building and renovating living quarters for patients in leprosy colonies, building out-patient departments for leprosy patients in district hospitals, and provided the district leprosy control teams with stationery, office equipment and furniture.

However, as the National Leprosy Control Programme expanded its coverage more and more cases came forward to be admitted into these colonies. There came a time when new cases could not be accepted anymore as living accommodations and funds became insufficient By mid sixties new admissions into these colonies were stopped. As dapsone treatment was provided as a domiciliary treatment to patients it became apparent that there was no need to treat them in institutions. However, patients affected by leprosy came on their own will to live in and around these colonies and sometimes they brought along their families because of severe stigma and discrimination directed towards them in the community.

The biggest draw-back in treating patients in colonies and homes in Myanmar was that these patients over a period of time became more outcasts and stigmatized by the general community and re-integration into the society became almost impossible. As the allowance provided by the government for food became insufficient due to high inflation, people affected by leprosy living in these colonies practically had to fend for themselves for their daily existence. With rapid urbanization occurring during the last 2 decades especially in district towns, encroachments by new settlements occurred and these government operated leprosy colonies slowly lost their identity and merged unofficially into the peri-urban areas where first and second generation off-springs of leprosy affected persons and the general population co-exist without any social problems. Over the years some of these colonies totally integrated into the peri-urban areas of nearby towns and no longer exist as specific leprosy colo y anymore.

In addition to the above mentioned leprosy colonies, a new resettlement village called Mayan Chaung was established in 1989 - 1990 that was located about 30 miles outside Yangon City by the government. The residents of this colony are mainly people affected by leprosy who at one time lived around the Htauk Kyant Leprosy Hospital. This establishment is currently supported by financial assistance from local well wishers and Ministry of Social Welfare. Recently, Mother's Trading and Construction Company Limited built new living quarters for persons affected by leprosy and named it Myitta Parahita Gayhar. This donor also provides funds for daily meals as part of its cooperate social responsibility activities. This leprosy home accepts new admissions and currently accommodates around 100 persons affected by leprosy.

In addition to the government operated colonies, there are 4 colonies still functioning in the country located in Kyaing Tong, Loilem, Thayet and Mawlamyaing Towns which are run by missionaries. The Nyaung Gan Leprosy Home in Kyaing Tong, Eastern Shan State was established in 1934 as a village and it later transformed into a home for leprosy affected persons. The colony in Loilem which is run by the Roman Catholic Mission was established in 1926 as a shelter to isolate leprosy affected persons. It now functions as a home and renders medical services in collaboration with the district leprosy control team. It also provides social and economic rehabilitation services and carries out health education activities in local ethnic languages. The one in Thayet Town is called St Teresa Leprosy Home and it provides care to people affected by leprosy in the central part of the country. These colonies still accepts new comers and provide a place of solitude for destitute cases having nowhere to go.

In addition to these colonies, the Ministry of Social Welfare during the late seventies opened 3 Child Care Centers for children of people affected by leprosy. These centers were opened in Htauk Kyant, Mandalay and Kyaing Tong. Off-springs of people affected by leprosy were housed and provided education in these facilities by the government. However, it was found later that this created a lot of social problems for the children and their parents especially when the children are not orphans. This initiative was even seen to enhance discrimination by selectively treating these

children as a special case. Around mid seventies, these establishments were converted into a regular child care center by the Ministry of Social Welfare.

4.2 Leprosy homes and hospitals

During the country's pre-independence period, there were 4 well known leprosy hospitals in the country run by Christian missionaries. One was located in Mawlamyaing Town in Mon State which started out in 1898 as a leprosy colony but later developed into a hospital called Maulmein Leprosy Home and Hospital which was also called Susan Haswell Hospital that accommodated 200 patients. A second hospital was located in Kyeemyindine Township in Yangon and was called Kyeemyindine Leprosy Home that accommodated 450 patients and a third hospital was situated in Mandalay called Wesleyan's Leprosy Home (later called Leprosy Home and Hospital) which was established in 1890 and accommodated 330 patients. A fourth hospital was also located in Mandalay and known as St John's Leprosy Home and Hospital. It was established in 1950 and accommodated 300 patients.

When the National Leprosy Control Programme was launched in 1951 the authorities decided that a government hospital should be established to provide treatment for leprosy patients in the country. With this mandate, the leprosy sanatorium operated by the Insein District Leprosy Society in Satthadaw Village in Hmawbi Township was moved to Htauk Kyant village is located 20 miles outside the capital city Yangon. It was called State Leprosy Sanatorium. It accommodated around 450 patients. Later this sanatorium was upgraded and a hospital was added with inpatient facilities to treat leprosy patients with various complications and it became known as Htauk Kyant Leprosy Hospital. It later established a reconstructive center for surgical rehabilitation. This hospital accepted referrals from all over the country for reconstructive surgery and inpatient care for patients suffering from severe reactions and chronic ulcers. In addition, this center was also the main training center for paramedical and medical officers joining the leprosy control programme. Basic as well as refresher training courses on leprosy were given at this center for all categories of leprosy workers. This center also provided livelihood training to disabled patients as part of the rehabilitation programme.

The 2 hospitals in Mandalay and the one in Yangon were taken over by the government in 1966. The hospital in Kyeemyindine Township in Yangon was converted into a chronic care hospital. Later, in the early eighties it was again converted into an orthopedic hospital and the remaining people affected by leprosy were moved to Htauk Kyant Hospital. The hospital in Mandalay called St John's Leprosy Hospital and Home was taken over by the government and renamed as Mandalay Leprosy Hospital (also known as Manawyaman Leprosy Hospital) that had 400 beds and continued to function as a leprosy specific hospital under the Ministry of Health.

Wesleyan's Home and Hospital after nationalization remained as a leprosy home only and the hospital wing was closed. All inpatients from this hospital were transferred to Mandalay Leprosy

Hospital (Manawyaman). Similarly, at the end of 1987 around 150 patients that were long staying patients in Htauk Kyant Hospital were moved to Mandalay Leprosy Hospital and the hospital was closed as the number of admissions to this hospital for inpatient care was declining.

In 1990, Mandalay Leprosy Hospital was closed and moved to a new location in Madaya Township, Mandalay Division. This new leprosy hospital was called Yenatha Leprosy Hospital and it was built by the Mandalay Division Administrative Authority. This hospital currently provides services for reconstructive surgery and inpatient care for reactions and ulcers. It also functions as a training center for paramedical health workers. In 2000, with assistance from Japanese International Aid Corporation (JICA) this hospital was strengthened and the training facilities and accommodations for trainees were upgraded. With prevalence and the number of new cases declining throughout the country especially after the introduction of MDT, Yenathar Leprosy Hospital is faced with difficulties in maintaining the services it routinely provides to people affected by leprosy, especially as the number of cases coming for medical and surgical care has dramatically declined.

Christian Leprosy Hospital in Mawlamyaing continues as a leprosy hospital and provides diagnosis, MDT treatment, general disability care, reconstructive surgery services and rehabilitation for persons affected by leprosy. This hospital is being further strengthened into a center of excellence for leprosy. Its future plan is to be a service center for chronic diseases and a general health care center.

4.3 Reconstructive surgery

Reconstructive surgery in Myanmar was first carried out at Maulmein Leprosy Home (later called Susan Haswell Hospital) in Mawlamyaing Town by Dr Edward who was trained in the early fifties at Christian Medical College in Velore, India. During the early sixties, physiotherapist U Soe Win was also trained in Velore, India and worked as a physiotherapist at the St. John's Leprosy Home and Hospital and when this hospital was taken over by the government he continued his work at this hospital. Later in 1964 with support from WHO, Dr Pe Khin was trained at the same college in India and upon his return to the country a surgical unit was established at the Special Skin Clinic in Yangon General Hospital where reconstructive surgery was performed. Later, when the government took over the Kemindine Leprosy Home and Hospital it was converted into a chronic care hospital and a reconstructive surgical unit for leprosy was opened in this hospital with Dr Pe Khin as its chief surgeon. This unit later became a hand surgery unit when this hospital was converted into an orthopaedic hospital. By that time, 2 additional reconstructive surgeons were trained with support from WHO in India. One was stationed in Htauk Kyant Hospital and the other was stationed at the newly opened reconstructive surgery unit in Mandalay Leprosy Hospital. The reconstructive surgery unit in Mandalay provided services to patients from central and upper part of the country till the time it was closed and moved out to Yenathar Leprosy Hospital.

4.4 Community based rehabilitation

The National Programme since the time of its initiation was mainly focused on increasing dapsone coverage. However, the importance of prevention of disabilities was also recognized as disability was a common occurrence among people affected by leprosy at that time. In 1964 the booklet on “How to prevent disability” written by Dr Paul Brant was translated into Burmese and published by the Union of Burma Leprosy Relief Association for use in the National Programme. In addition, general health education pamphlets on leprosy were also produced for distribution to the general public. In the mid-sixties the National Programme trained its specialized workers (junior leprosy workers) for disability prevention activities and provided them with a special kit to dress wounds in the field However, as the dapsone treatment was designed as a domiciliary treatment programme its main objective was to find new cases as much as possible and treat them immediately with dapsone. The field worker (Junior Leprosy Worker) had to cover a population of around 30,000 to 50,000 and spent most of their time travelling from village to village delivering dapsone tablets and making sure that patients are taking their treatment regularly. Whenever they come across patients with impairments and disabilities they provide basic information to the patient on how to care for their anesthetic hands and feet. They also taught how to dress the wounds for cases with ulcers. Apart from carrying out this very basic prevention of disabilities (POD) activities, these specialized workers were not able to give sufficient time for disability prevention activities and as a result the impact of this initiative was not seen much. The general health care system neither had a rehabilitation programme at the community level to which leprosy affected person could go and obtain care from.

In the early eighties with support from WHO, the Department of Health started a Community Based Rehabilitative (CBR) Programme that included leprosy. However, due to lack of human resources and funds this programme was unable to move beyond the pilot stages and its impact at the village level was almost insignificant Disabled leprosy patients still had to rely upon the National Leprosy Control Programme for disability prevention and care services.

Myanmar Christian Leprosy Mission (MCLM) that was established in 1984 in cooperation with the Myanmar Council of Churches provided support to patients in their treatment and helped persons affected by leprosy to socially integrate into the community irrespective of race and religion. It has 10 service centers distributed throughout the country located in old leprosy colonies and homes. These centers are networking with the Christian Leprosy Hospital in Mawlamyaing and patients are referred to the hospital for treatment of complications and surgical rehabilitation. MCLM also provides educational support, livelihood support, microfinanc , development of model villages, and conducted workshops for persons affected by leprosy to promote confidence and encourage leadership.

In addition, rehabilitation activities were carried out by the National Programme with support from World Vision International from 1994 to 1997 in 4 townships and ADRA Myanmar in Mayanchaung and Nanthar Myaing villages.

In 1994, with support from UNDP a Human Development Initiative (HDI) was introduced in 40 townships during the period 1994 - 1998. This project focused on leprosy and its activities were integrated into the Basic Health Services. This initiative covered 4 areas namely: health, education, economics and social. Under the health component it supported case-finding and treatment, self-care to persons affected by leprosy and provision of tools and devices for disabled persons. Under educational component, it provided education support and vocational training. It also provided micro-credit to those who are in need. In the social area, it supported advocacy workshops in townships to involve persons affected by leprosy and to reduce stigma. At the end of the 5 years project period, the POD activities were carried on with support from international partner agencies namely, The American Leprosy Mission (ALM) and The Netherlands Leprosy Relief Association (NLR).

The National Leprosy Control Programme after attaining the goal of elimination of leprosy as a public health problem, in 2003 realized that it now needs to pay more attention to POD activities. The drastic reduction in prevalence along with a slow but steady decline of annual new case detection provided more time for the health worker to carry out POD activities.

POD activities were further promoted in the country with support from the Netherland Leprosy Relief Association (NLR) and American Leprosy Mission (ALM). Health workers from both the specialized National Leprosy Control Programme and the Basic Health Programme were trained to carry out POD activities in the field Presently, POD activities for person affected by leprosy are been carried out in 225 townships.

With support from JICA a disability survey was carried out in 2003 - 2004[2] in 9 townships in Sagaing, Mandalay and Magwe Divisions. A total of 4,339 persons affected by leprosy who have completed MDT treatment were re-examined. The mean age of the surveyed population was 47.3 ± 16.6 years. It was found that 36.8% of them were having WHO grade 2 disabilities (defined as any visible disability occurring in hands, feet and face). Grade 1 disability (anaesthetic hands and feet) was seen in 2.9% of the cases. WHO disability grade 1 and 2 combined amounted to about 40% of the surveyed population. As a result of the disease process, it was found that as the age of the patient increases the disabilities got worse. Of the 1,598 persons reported with grade 2 disabilities, 925 cases (57.9%) are in the 20 - 59 years age group. This shows that disabilities are high in the working age group.

4.5 Self Care

As the number of cured leprosy patient (release from treatment) surpassed the number of cases registered for treatment it became apparent that the disability problems faced by people affected by leprosy are huge at the community level. As part of the CBR activities, it became apparent that the best way to tackle this huge problem of disabilities in the community is to prevent disabilities from occurring in the first place. However, the magnitude of the problem that currently

exist in the community exceeds the work load of diagnosis and treatment activities. To address this problem the National Programme adopted the approach of self care. It became one of the important activities that the Programme carried out after achieving the target of Elimination of Leprosy as a Public Health Problem. The Programme trained its workers from the specialized programme, as well as those in the Basic Health Service, in disabilities prevention activities and self care. People affected by leprosy were taught how to take care for their anaesthetic hands and feet and also how to dress their wounds properly.

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5. Epidemiology: Declining trends in leprosy

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Leprosy is one of the few diseases where till now there is no specific test for diagnosis. Neither is there a test to identify the at risk population groups. Due to long incubation period (2 - 10 years) it is also very difficult to measure the disease incidence as a large cohort of individuals has to be followed over a period of several years. Measuring disease incidence is too time consuming and costly. Because it is difficult to measure incidence on a regular basis, the annual new case detection is used as a proxy indicator for incidence in leprosy.

Similarly, to get data on the true prevalence of disease in an area, one has to conduct a cross-sectional survey which is again time consuming and costly. From time to time, such prevalence surveys were carried out so as to get an estimate of the true prevalence in an area and compare it to the registered prevalence (cases on the treatment register). The difference provides an estimate of the magnitude of back-log cases (cases that still remains to be detected).

During the days of dapsone monotherapy in Myanmar, as the treatment was life-long for the majority of leprosy cases, the registered number of cases under treatment (registered prevalence) was the key indicator used by the National Leprosy Control Programme to monitor the disease problem. As most of the patients were put on treatment with dapsone for 5 - 10 years and in some instances life-long, this resulted in the pool of registered prevalence cases increasing gradually from year to year especially in high endemic regions of Central Myanmar. Importance was given more to prevalence compared to new case detections during that time, as the prevalence reflects the magnitude of the problem in the community. The work load of leprosy workers as well as the calculations for drug requirements was all based on prevalence.

With the introduction of MDT that had a much shorter treatment duration, more and more cases were discharged (known as release from control) compared to the days of dapsone monotherapy. This resulted in the registered prevalence (cases on MDT treatment) to decline rapidly and at one point in time the registered prevalence decreased to a level below that of the number of

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newly detected cases in that area. As a result of the changes observed in the trends in prevalence and new case detection, the National Leprosy Control Programme changed its emphasis and started to monitor new case detection more in detail.

As the intensity of transmission of the disease in an area decreases it is expected that the number of newly detected cases will also decrease reflecting the reduction in incidence. This is based on the assumption that the case finding activities in an area has not changed ver time and is assumed to be constant.

5.1 Dapsone mono-therapy period

Leprosy has been endemic in Myanmar for centuries. The earliest report on leprosy was found in the Report of the Leprosy Commission in India[1] in which it was reported that in 1881, there were 2,589 cases in Arakan, Pegu, Irrawaddy and Tenesserim Divisions. The prevalence rate was reported as 6.9 per 10,000 population in these 6 divisions. The highest prevalence was reported in Irrawaddy Division with 9.5 per 10,000 populatiom. No mention was made about the leprosy situation in this report about Upper Myanmar.

In 1932, based on the census carried out by the British, an estimate of 11,127 leprosy cases in the country was reported with an estimated prevalence rate of 0.76 per 1,000 population[2]. At that time the estimated population in the country was around 15 million only. In 1951, Dr Dharmendra came to Myanmar as a WHO consultant and he estimated the prevalence to be around 5 per 1,000 population. Based on this finding, the total number of prevalence cases in the country was estimated to be about 100,000 cases. However, Dr Lampe who worked as a WHO consultant in Myanmar from 1953 - 1955 increased the estimate and calculated that there could be around 200,000 cases (prevalence rate of 10 cases per 1,000 population)[2]. The estimate provided by Dr Dharmendra in 1951 could be an under-estimate because during that time there was an ongoing civil war in the country and he was able to visit only a few places and was not able to visit places where leprosy was highly endemic.

This alarming situation in the country led the government at the time of independence to give priority to leprosy. This led to the establishment of a National Leprosy Control Programme in the country to tackle this problem urgently. The strategy at that time was to find leprosy cases and provide domiciliary treatment with dapsone. After establishing dapsone treatment centers in 27 districts, the registered prevalence increased dramatically from 4,650 cases in 1952 to 35,200 cases in 1956[2].

Again in 1963, WHO Leprosy Advisory Team[3] (LAT) carried out a survey and increased the estimated number of leprosy cases to around 590,000 (prevalence of 25 per 1,000 population). This survey also reported that in central Myanmar where leprosy has been known to be highly endemic, the prevalence estimated was as high as 40 per 1,000 population.

Table 1. Prevalence and profile of new case detected during dapsone treatment period, 1958 to 1982 (5 year average).

Indicators (average for 5 years period)	1958 - 1962	1963 - 1967	1968 - 1972	1973 - 1977	1978 - 1982
Average number of prevalance cases (rate /10,000)	69 947 (32.0)	157 236 (64.7)	225 445 (83.0)	261 606 (86.2)	257 470 (76.68)
Average number of new cases detected (rate/10,000)	-	-	12 270 (7.4)	10 932 (3.6)	9 921 (2.9)
Average number of new lepromatous cases detected (%)	-	-	1 460 (11.9)	1 684 (15.4)	1 954 (19.7)
Average number of new children cases detected (%)	-	-	3 288 (26.8)	2 361 (21.6)	1 865 (18.8)

Source: National Leprosy Programme Annual Reports, Department of Health, Ministry of Health

Ten years later in 1973 - 1974, the Programme carried out another survey (National Survey) and the prevalence then was estimated to be 24.24 cases per 1,000 population[4]. This shows that the prevalence has stabilized. The duration of treatment at that time with dapsone was life-long for all types of cases.

Table 1 shows the 5 years' average of registered prevalence, average number of new cases detected, average number of lepromatous and children cases detected[5]. During 1958 - 1962, the yearly average of registered prevalence was reported to be around 69,900 cases. During the period 1968 - 1972, the National Leprosy Control Programme was further strengthened and control activities were carried out intensively all over the country. As a result of these activities the registered prevalence increased to about 225,000 cases and the average number of newly detected cases each year was reported to be 12,270 cases during the period 1968 - 1972. As the coverage of the Programme increased and control measures improved the registered prevalence peaked during the period 1978 - 1982 to a yearly average of around 257,000 cases and the new case detection around 10,000 cases. In addition, children cases (under 15 years) declined remarkably from 26 % of total cases under treatment in 1957 to 5.9% in 1980.

The registered number of leprosy cases in the country reached the highest level in the year 1978 with a registered prevalence of 262, 615 cases of which 22.84% were lepromatous cases and 7.85% were children under 15 years of age.

Table 2. Prevalence and profile of new case detected during MDT treatment period, 1985 to 2014.

Indicators	1985	1990	1995	2000	2005	2010	2014
No. of prevalance cases (rate /10,000)	240 474 (65.4)	129 111 (27.6)	21 680 (4.1)	11 006 (2.2)	2 679 (0.48)	2 569 (0.49)	2 687 (0.43)
No. of new cases detected (rate/100,000)	6 600 (17.9)	6 204 (15.5)	9 380 (20.9)	10 717 (23.6)	3 571 (7.4)	2 936 (5.62)	2 877 (4.6)
No. MB among newly detected cases (%)	2 383 (36.1)	2 431 (39.2)	3 460 (36.9)	5 832 (54.4)	2 175 (60.9)	2 046 (69.7)	2 209 (76.8)
No. of Children among newly detected cases (%)	908 (13.8)	688 (11.1)	934 (9.9)	976 (9.1)	226 (6.3)	161 (5.5)	119 (4.1)
No. of Grade 2 disabilities among newly detected cases (%)	1 822 (27.6)	1 005 (16.2)	612 (6.5)	797 (7.8)	346 (9.7)	400 (13.6)	415 (14.4)
New case grade 2 disabilities rate (per 1,000,000)	49.5	25.0	14.2	17.4	7.2	7.6	6.7

Source: National Leprosy Programme Annual Reports and Global leprosy situation, Weekly Epidemiological Records, Geneva, World Health Organization

5.2 Multi drug therapy period

As shown in Table 2, with the introduction of MDT in 1988 the most significant impact observed was the dramatic reduction in the registered prevalence of leprosy in the country. This was mainly due to the effectiveness of MDT which allowed patients undergoing treatment regularly to be discharged from treatment (cured/completed treatment). The shortening of the duration of treatment for MB from treating them till skin smears becomes negative (average 5 years) to a fi ed duration treatment of 2 years which was later further reduced to 12 months resulted in a more rapid decline in the registered prevalence. Short treatment duration also improved treatment compliance which contributed toward patients taking treatment more regularly. The combined effects of shorter treatment duration and better compliance contributed to the dramatic decline of the registered prevalence within a decade.

A milestone in the history of leprosy control in Myanmar occurred in 2003 when it attained the target of Elimination of Leprosy as a Public Health Problem. For the first time in the history of the country the registered prevalence rate fell to lower than 1 case per 10,000 population (the target for elimination of leprosy as a public health problem set by WHO). At the end of December 2003, the registered prevalence rate was 0.51 per 10,000 population[6].

However, decline observed in the new case detection was not that dramatic. In fact, because of Leprosy Elimination Campaigns (LECs) conducted from 1998 to 1999, the number of new cases increased to over 10,000 cases in the year 2000 (Table 2). It was only after 2005 that the new cases started to decline. Over the past 5 years the number of new cases detected yearly declined at a much slower rate. In 2014, over 2,800 new cases were reported.

Another phenomenon observed during the MDT period was the increase in MB proportion from around 36% in 1985 to around 77% in 2014. This was attributed to changes in the criteria for MB classification However, some of this increase could also be due to changes occurring in the immune status of the population for reasons that are still not well understood as yet.

The total number and also the proportion of child cases among newly detected cases declined during the MDT period from around 900 cases (13.8%) in 1985 to 119 cases (4.1%) in 2014. This shows that the transmission in the community has reduced to some extent but it has not ceased totally.

The rate of new cases with grade 2 disabilities (per million population) as well as the proportion of grade 2 disabilities among new cases is declining. The presence of grade 2 disabilities among new cases denotes a delay in case detection. The delay in new case detection can lead to damage to the nerves resulting in disabilities that are very difficult to treat and correct. In addition, the delay in detection can also extend the period of infectivity of the patient that contributes towards the presence of a large pool of source of infection in the community. Being aware of the need to detect new cases at an early stage, the National Programme adopted the WHO strategy to monitor grade 2 disabilities rate (per 1,000,000) among new cases as a target indicator to monitor and evaluate the effectiveness of the leprosy control activities in the country. The grade 2 disabilities proportion has declined from around 28% in 1985 to around 14% in 2014. The new case grade 2 disabilities rate has also declined from 49.5 per million population in 1985 to around 6.7 per million population in 2014.

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6. Elimination of stigma and discrimination: changing attitudes and practices in communities

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6.1 Abolishing laws discriminating persons affected by leprosy

At the time of independence, Myanmar inherited many British laws that pertain to leprosy. These laws were drafted at the time when there was no effective treatment for leprosy and the intention of these laws was to prevent leprosy affected persons from coming into contact with the general population. At the time of independence from Britain, all these laws were carried over by the post independence government. In the Leprosy Act[1], leprosy was defined as that form of leprosy (open leprosy) where leprosy bacilli can be demonstrated by any recognized standard method of examination approved by the Director of Medical and Health Services. It was only in 1950 that reviews of these laws were made by the Directorate of Health. The Leprosy Act 1898 was amended as Leprosy Amendment Act of 1951 and sections of the law that were discriminatory in nature were removed. With these amendments, leprosy was re-defined as lepromatous cases only and the use of discriminatory words in Burmese language was prohibited. Only leprosy affected persons who were paupers were required to be detained in institutions. The law also prohibited leprosy patients from working in certain types of trade that can lead to spread of the disease.

In addition to the Leprosy Act, there were also other laws relating to leprosy such as: Village Act, Railways Act, Inland Waterways Act and Municipal Acts that included measures on how to deal with individuals having infectious and contagious diseases. In these acts leprosy was included under infectious and contagious diseases in general. These laws were discriminating in nature and stigmatizing. In 1972, old laws that were no more relevant to the present day situation were amended. In this Public Health Act, under the chapter of control of communicable diseases leprosy was included.

The Sterilization Act passed in 1974 provided special opportunities to persons affected by leprosy to obtain sterilization upon request at government hospitals at no costs. Based on the Sterilization Act the Director General of Health Department issued an executive order that provided easy access for sterilization service to leprosy affected persons that even extended this service to their spouse if the affected person is unable to undergo surgery. The sterilization criteria set for the general population was much more rigid than that set for leprosy affected person. This service was not compulsory and was only offered upon request. However, very few individual came forward to obtain this service.

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6.2 Declaration on leprosy (UN Human Right Commission Resolution)

In 2008, the United Nations Convention to the Rights of People with Disabilities came into force and Myanmar was a signatory at this convention. This Convention is of critical importance in protecting the right of all disabled persons including those affected by leprosy[2]. A more specific resolution[3] was passed by the United Nations Human Rights Council in June 2008 called "Elimination of discrimination against persons affected by leprosy and their family members".

6.3 Participation of persons affected by leprosy in leprosy control activities

As an outcome of these UN resolutions, the Global Leprosy Programme of WHO organized a meeting in Manila in 2010 to develop guidelines[4] to strengthening the participation of persons affected by leprosy in leprosy services. Myanmar was a participant at this meeting. As an outcome of this meeting, the National Programme became aware of the need to include activities in its annual plans to promote participation of persons affected by leprosy and its family members in leprosy control activities. The support provided by people affected by leprosy in carrying out routine control activities as well as in tackling the problem of stigma and discrimination at the community level was considered to be very important.

With the aim to support and encourage people affected by leprosy to become more involved and be partners in rehabilitation activities, a community based group called "Myitta Ar Mann" was formed in 20 districts. The members of this group are retired leprosy workers and people affected by leprosy. All the members in this group are volunteers and its activities are supported by donations received from local well wishers and the Sasakawa Memorial Health Foundation / Nippon Foundation (SMHF / TNF). Myitta Arr Mann provides educational support, livelihood training to individuals based on their specific needs, animal husbandry and interest free small loans for expansion of business. People affected by leprosy who suffered losses during the recent floods that occurred in the country during mid 2015 were also provided with cash to help them recover from hardships as a result of the flood . This emergency support was provided to 140 households in 3 districts in the country that were declared as disaster areas.

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7. Research: Contributions towards developing new tools to fight leprosy globally

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The National Leprosy Control Programme has been collaborating with WHO and many other research organizations in conducting various research on leprosy in the country. The results from these researches have contributed towards many important changes in the strategy and guidelines in both technical and operational areas.

7.1 BCG vaccine trails

The National leprosy control programme in collaboration with WHO carried out a large scale research from 1964 to 1975 in Singu Township of Central Myanmar[1] to find out the effectiveness of BCG vaccine against leprosy. A total of 13,066 children (under 14 years) received BCG and 13,176 controls received no BCG vaccines. The over-all protectiveness of BCG was found to be 20%. It was found that the protectiveness varies with the batch of the vaccine plus age, sex and contact status of the children. The results were similar to that which was reported from India[2]. The low protective effect of BCG vaccine observed in this study was suspected to be due to the presence of Atypical Mycobacterium (M. Vacae and M scrufulaceum) in the environment in upper Myanmar. Another possible reason could be that BCG was only given once to the subjects in the current study and also the fact that 2 types of BCG (F23J and F53H) were used in the study that could be inducing different degrees of immune responses. The overall protective effect with F23J was reported to be 10.7% and F53H was 30%[3].

The National Assessment Survey conducted in 1973[4] reported the effectiveness of BCG vaccine in preventing leprosy to be 79.75%. It reported that the incidence of leprosy was reduced by 56.66%.

A case control study on BCG vaccine's effectiveness (VE) was carried out in Myanmar[4] in 1992 - 1993. Cases were those under active treatment between the ages of 6 to 24 years. Controls

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(non-case) were matched according to age, gender and neighbourhood. Overall VE was found to be 66%. The protection against PB leprosy was 74% and against MB leprosy it was 57%. The study also found that the protection afforded by BCG vaccine was found to be higher when first dose was given before the age of one year and protection increased with the number of doses given. This finding as similar to what was found in the trial carried out in Karonga District in Malawi[6].

Based on all the above findings regarding the effectiveness of BCG, the National Programme supported and encouraged BCG vaccinations as part of the Universal Childhood Immunization activities in the country.

7.2 Rifampicin trials

A trial on the use of rifampicin to treat leprosy was carried out from 1976 to 1984 in Singu Township which was the same area where the BCG trial was carried out[7]. The aim of the study was to give supplementary supervised treatment with rifampicin to all infectious patients in the study area to render them non-infectious. The study recruited 363 lepromatous, borderline lepromatous and borderline cases (all bacteriologically positive) in Singu Township and these cases were given rifampicin 600 mg daily for 30 days plus dapsone 100 mg daily. In addition, DADDS 225 mg injection was given once every 2 months for 4 years. Cases with suspected signs of dapsone resistance were given clofazimine 100 mg in addition to the above mentioned rifampicin and dapsone drugs. Wetlet, Shwe Bo and Khin Oo Townships were selected as control areas and 146 bacteriologically positive cases were given dapsone monotherapy 100 mg daily. At 2 years follow-up, all cases improved clinically and the bacteriological index fell satisfactorily. By the 5th year of follow-up, 12 out of 271 (4.43%) cases showed signs of reactivation. All cases at the time of annual follow-up were then given rifampicin as a single dose 1,500 mg annually and the signs of reactivation subsided. The study also reported that the incidence of leprosy reduced from 4.9 cases per 1,000 population in 1976 - 1977 to 0.9 per 1,000 population in 1983 - 1984 in Singu Township. In the control area the leprosy incidence also declined from 5.1 per 1,000 population to 1.7 per 1,000 population.

Based on these finding , the National Programme made a decision in 1983 to add rifampicin in addition to dapsone in treating lepromatous, borderline lepromatous and borderline cases.

7.3 Dapsone resistance survey

The study to determine dapsone resistance was carried out in Myingyan Township during 1980 to 1983[8] with support from WHO. A total of 779 lepromatous patients treated with dapsone monotherapy for more than 5 years and having a bacteriological index (BI) of more than + 3 were recruited into the study. The study found that 38.6% of the lepromatous cases were dapsone resistant based on mouse foot-pad inoculation. The annual incidence of dapsone resistance among lepromatous cases was reported to be 3.4% per year.

7.4 New treatment regimen: Rifampicin, Ofloxacin and Minocycline (ROM) trials

An open field trial was carried out in Myanmar with WHO support in 1995 to test the efficacy of the combined monthly therapy of rifampicin 600 mg, ofl xacin 400 mg and minocycline 100 mg (ROM) regimen[9].

Cases for the trial were recruited mainly from Mon State and some from the Central Special Skin Clinic of Yangon General Hospital and Leprosy Clinic at Bago Town. Four regimens were tested and they are:

- Regimen A: Type MB for which ROM was given once a month for 12 months.
- Regimen B: Type MB for which ROM was given once a month for 24 months.
- Regimen C: Type PB for which ROM was given once a month for 3 months.
- Regimen D: Type PB for which ROM was given once a month for 6 months.

All together a total of PB 222 cases and MB 472 cases were recruited for the short regimens (Regimens A and C) while PB 110 cases and MB 210 cases were recruited for the long regimens (Regimens B and D) of the trial. The total number of cases registered for treatment with ROM was 1,014. Efficacy of the regimens was assessed in terms of confi med treatment failure rate of 1% per year while on treatment and/or confi med relapse rate of 1% per year during the follow up period of up to 7 years from the date of inclusion in the trial.

Table 1. Relapse rates in the 4 ROM regimens

Regimen	Person-years of observation	Number of relapse cases	Relapse rate (per 1,000 person years)
A	2700	3	1.11
B	1264	1	0.79
C	1300	6	4.62
D	669	2	2.99

Based on the above finding , it was concluded that longer duration of treatment with ROM (B and D) for both MB and PB is slightly better than short regimens (A and C). However, as this regimen was more expensive without having any additional benefit compared to the current MDT treatment, it was not used by the National Programme.

7.5 *M. leprae* genome studies

The Department of Medical Research (Lower Myanmar) in collaboration with the Central Special Skin Clinic and Leprosy Research Center, National Institute of Infectious Disease, Japan carried out a study examining the polymorphism of TTC repeats in *M leprae* from slit skin smear samples of leprosy patients attending the Central Special Skin Clinic of Yangon General Hospital in 2011 along with nasal swab samples of their household contacts[10]. Slit skin smear samples were

collected from 22 MB patients. Two samples were taken from 21 patients and from one patient 3 samples were taken. Nasal swab samples were collected from 92 household contacts of the 22 subjects in the study who were living in 18 houses. The study found that TTC genotype from the index patient and household contacts are different. The study highlighted the possibility of family members being infected from an infectious source other than the MB index case. Individuals could have been exposed to infection outside the home.

7.6 Drug resistance study based on dot blot hybridization method

A study to find out rifampicin, dapsone and ofl xacin resistance using dot blot hybridization method in Myanmar[11] was carried out by the Department of Medical Research (Lower Myanmar), Central Special Skin Clinic and Leprosy Research Center, National Institute of Infectious Disease, Japan in collaboration with from 2005 to 2007. A total of 100 MB attending the Central Special Skin Clinic in Yangon general Hospital were studied for mutations in folP, rpoB and gryA genes. It was found that 93% of the cases were susceptible to all 3 drugs. Seven cases were found to be having resistance. Among these 7 cases, 3 were dapsone resistant, 1 was rifampicin resistant and 2 were quinolone resistant. One case was found to be both dapsone and rifampicin resistant. Quinolone is not recommended for use to treat leprosy in Myanmar and the resistance seen in the study could be due to improper use of this drug for other medical conditions.

The data from this research helped raise awareness about the dangers of drug resistance in leprosy treatment and was instrumental in the establishment of global drug resistance surveillance programme.

7.7 Global surveillance for drug resistance

WHO's Global Leprosy Programme recognized that drug resistance especially to rifampicin could lead to serious problems for the national leprosy control programme. MDT (a combination of 3 drugs) that was recommended by WHO in 1982 was meant not only to solve the issue of dapsone resistance problem but also to prevent future drug resistance occurring to any component of the drugs included in the MDT regimen. In theory, any drug combination when used for long periods of time in a patient (such as in the case of MB treatment) can lead to resistance. There was also limited information on patient compliance with the unsupervised components of MDT. WHO initiated a Global Surveillance of Drug Resistance Programme in 2008[11] to monitor the situation of drug resistance.

Myanmar was one of the key countries in initiating this sentinel surveillance programme. The Central Special Skin Clinic of Yangon General Hospital and the Special Skin Clinic of Mandalay General Hospital are the 2 main sentinel sites in the country that participated in this global effort to monitor drug resistance. Skin smear materials taken from relapse cases diagnosed at these 2 clinics were sent to the Leprosy Research Center, National Institute of Infectious Disease, Japan

for *M. leprae* DNA sequencing and detection of missense mutations in rpoB, gyrA and folP1 for rifampicin resistance and folP for dapsone resistance. Resistance to Ofl xacin (missense mutations in gyrA) was added in the surveillance programme although it has not been used in the country for the treatment of leprosy except for research purposes.

Myanmar is one of the few sites that have reported dapsone or rifampicin resistance. Regarding dapsone resistance it reported 3 cases in 2008[13], 1 case in 2009[14] and 2 cases in 2010[15]. Regarding resistance to rifampicin, it reported 2 cases in 2008[12] and 1 case in 2009[14]. Myanmar reported one case of multiple drug resistance case (resistance to both dapsone and rifampicin) in 2008[16]. Ofl xacin resistance was reported in 2006 - 2007 in Myanmar which was before reports from India in 2009[14].

With the aim to simplify collection of specimens and transportation to the laboratory for DNA sequencing, the Department of Medical Research (Lower Myanmar) in collaboration with the National Leprosy Programme and the Leprosy Research Center, National Institute of Infectious Disease, Japan carried out a study to find out the suitability of using FTA® elute card. It compared skin smear specimens collected by using FTA® elute card to collection in 70% ethanol tubes. Out of 192 cases, PCR detection of M. leprae was positive in 116 (60%) FTA® elute cards and 112 (52%) cases in 70% ethanol tubes. The findings indicates that the samples collected by FTA® elute card can substitute for 70% ethanol tube and is a suitable medium for collecting, transporting and storing slit skin smear samples. Samples collected on FTA® elute cards are amenable to fast and reliable extraction of DNA for subsequent molecular detection of *M. leprae* DNA[17].

7.8 Rifampicin, Ofloxacin and Minocycline (ROM) chemoprophylaxis

Chemoprophylaxis study was carried out in Nyaungdon Township, Ayeyawady Region using rifampicin 600mg, ofloxacin 400mg and minocycline 100mg (ROM) in September 2003[18] by the Department of Medical Research (Lower Myanmar) and Central Special Skin Clinic of the Yangon General Hospital. The follow-up period was 6 years and the study ended in September 2009. A total of 829 household contacts and extended contacts (members of 3 households on either side of the index house) were tested for immunoglobulin M antibodies. Seropositive subjects were divided into chemoprophylaxis and non-treated groups each having 150 subjects including 48 children cases below the age of 15 years. During the first 3 years of follow-up no new cases of leprosy was detected in the 2 study groups. At the end of 6 years of follow-up, 1 new case was found in the chemoprophylatic group and 2 new cases in the non-treated group. New case detection rate in chemoprophylaxis and non-treated group are not statistically significant A single dose of ROM chemoprophylaxis seems to be not effective in preventing leprosy after 6 years of follow-up.

Based on this finding the National Programme did not recommend ROM chemoprophylaxis for leprosy control activities.

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8. Continuing the fight against leprosy: the way forward

Kyaw Lwin[I], Tin Myint[II], Maung Maung Gyi[III], Tin Shwe[II]

The success seen in the fight against leprosy in Myanmar can be attributed to many years of dedicated work carried out by health workers at various levels starting from head of the programme right down to the field workers namely, junior leprosy workers, leprosy inspectors, leprosy team leaders, regional leprosy officer , mid-wives, lady health visitors, public health supervisors, health assistants, township health officers and township medical officer . Among all the health workers who spent their careers either partly or totally in the Leprosy Control Programme, the one person who stands out among all others is Dr Tha Saing who started his career in the government health service as a young medical officer in 1926. He became interested in leprosy after coming across many leprosy patients while working in the rural areas. In 1947, he was appointed as Special Leprosy Investigative Officer in the Directorate of Health and was the key person who established the Leprosy Control Programme in the country in 1951. In 1953, he was promoted as Assistant Director of Health Services for his outstanding work in leprosy.

The 2 most important factors that made it possible for Leprosy Control Programme to achieve such success over the past six decades are its public health approach in implementing programme activities in the field and its timely response by developing new strategies to address the operational and technical challenges faced by the Programme. The support received from various international and local partners also strengthened the Programme in all areas of leprosy control. This support over a period of several decades contributed significantly towards the success of the Programme.

Leprosy is no more a public health problem in Myanmar and presently it is not a common disease in the community. However, the fight against leprosy is still not over as yet. Over 2,500 new cases are still detected annually in the country out of which around 4 - 5% of them are children cases. This shows that transmission is still occurring in the community. It is projected that new cases will continue to appear every year and for how long, know one can predict. However, the current slow declining trend in new cases has to be maintained until the time the disease is eliminated. It is now not the time to be complacent.

The Programme must continue with its efforts to find new cases at an early stage and promptly treat them. For that, resources are needed along with the necessary expertise in the country to tackle this disease at all levels. Inadequate financial and human resources as well as

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difficulties in maintaining a core group of experts in the country for leprosy control activities are going to be major challenges for the Programme in the coming decades. Without the necessary political commitment to invest resources for leprosy control activities in the country, the last mile in the fight against leprosy is going to be an uphill battl .

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