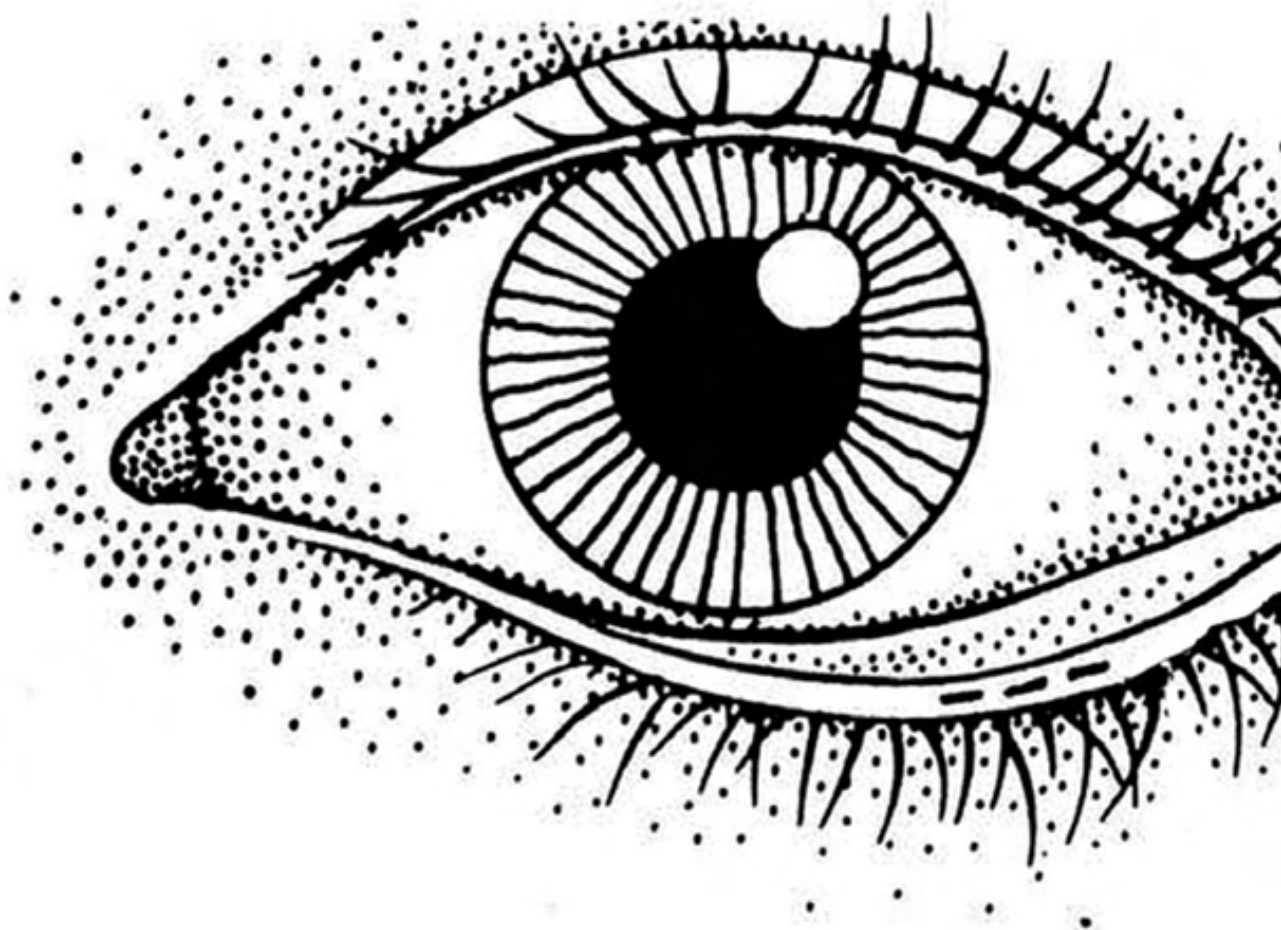


PREVENTION OF BLINDNESS IN LEPROSY



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**PREVENTION OF BLINDNESS IN LEPROSY
2ND EDITION**

**Edited by:
Paul Courtright
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GLOSSARY

Aqueous flare

The evidence of protein in the aqueous humour, a sign of breakdown of the blood-
aqueous barrier, often due to inflammation of the iris and ciliary body.

Dermatachalasis

Loss of normal elasticity of the skin leading to excessive skin folds, particularly of the
upper eyelids.

Ectropion

Outward turning of the eyelid margin, so that it is not in contact with the eyeball.

Entropion

Inward turning of eyelid margin, toward the eyeball.

Erythema Nodosum Leprosum (ENL)

An inflammatory condition of the skin characterised by painful red nodules and often
accompanied by fever and joint pains; a feature of the multibacillary form of leprosy. ENL
is often referred to as Type 2 Reaction.

Fluorescein

A chemical solution used to demonstrate superficial corneal damage, which appears as a
bright green area.

Iridectomy

Surgical excision of a piece of the iris.

Iritis

Inflammation of the iris; commonly associated with inflammation of the ciliary body. The
combined condition is iridocyclitis. Iritis is often referred to as anterior uveitis.

Keratitis

Inflammation of the cornea. In avascular keratitis new blood vessels are not yet invading
the cornea. Exposure keratitis refers to inflammation of the cornea due to exposure
and drying of the surface.

Lagophthalmos

A condition in which the eyelids cannot be completely closed to protect the cornea.

Meibomian glands

Glands situated in the tarsal plates of the eyelids secreting an oily substance, which spreads over the surface of the tear film and prevents excessive evaporation.

Miotic pupil

Small contracted pupil.

Multibacillary

Leprosy which includes polar lepromatous (LL) borderline lepromatous (BL) and mid-borderline (BB) types in the Ridley-Jopling classification. For field use, multibacillary includes all patients with more than 5 skin lesions.

Multi-Drug Therapy (MDT)

The combined therapy which may include rifampicin, clofazimine and dapsons and others recommended by WHO for treatment of multibacillary and paucibacillary leprosy.

Paucibacillary

Leprosy which includes only smear-negative indeterminate (I), borderline tuberculoid (BT) and polar tuberculoid (TT) cases in the Ridley-Jopling classification. For field use, paucibacillary includes patients with up to 5 skin lesions.

Reversal reaction

This reaction, which can occur in both PB and MB leprosy (mainly in formerly borderline patients of Ridley-Jopling classification), is the result of a sudden change in cellular immunity and is characterised by acute exacerbation of skin lesions and often accompanied by acute neuritis. Reversal reaction is also referred to as Type I Reaction.

Synechia

Adhesions between iris and anterior lens capsule.

Trichiasis

One or more eyelashes rubbing against the eyeball.

INTRODUCTION

The problem of eye involvement as a cause of disability in leprosy is well recognised. The successful, widespread use of multidrug therapy has led to significant reductions in the prevalence of leprosy worldwide; subsequently, there has been increased attention to the problem of disabilities, including those relating to visual loss.

A workshop on ocular leprosy was held in Broxbourne, UK from 3-5 July 2001, organized by the British Columbia Centre for Epidemiologic & International Ophthalmology and LEPRO and sponsored by ILEP. The list of participants at the 2001 workshop is given in Annex 1. The 2001 workshop came almost 11 years after the first ocular leprosy workshop, in London, in September 1987. Significant changes in the management of leprosy as well as increased knowledge about the ocular manifestations of leprosy led to the need for major changes to the earlier "Prevention of blindness in Leprosy".

This booklet, resulting from the workshop, is intended for use by all health workers and programme managers involved in leprosy control and prevention of blindness. We are grateful to the workshop participants for all of their contributions.

Publication of this booklet was made possible by a grant from American Leprosy Missions.

OVERVIEW

Visual impairment and blindness occur in patients with ocular leprosy; these individuals form a severely disadvantaged group because of other disabilities due to the disease, its social stigma and the difficulties and delay in receiving appropriate eye care.

Annually, 500,000 to 700,000 leprosy patients are being detected and put on anti-leprosy treatment. Since 1985 about 15 million leprosy patients have been diagnosed and been put on MDT treatment.

Data on blindness in leprosy is incomplete and often unreliable, because of the problems in obtaining representative population-based estimates. From existing surveys it is estimated that between one-quarter and one-half a million leprosy or ex-leprosy patients could be blind (vision less than 6/60). The visual disability in these patients is compounded by other disabilities, particularly sensory impairment and deformity of the extremities.

The incidence of blindness in ocular leprosy is influenced by many factors, especially anti-leprosy treatment, the type and duration of the disease, and eye treatment received. The three major pathways to blindness from leprosy are:

1. Corneal opacity arising from exposure associated with lagophthalmos and diminished corneal sensation
2. Iridocyclitis and its sequelae
3. Cataract arising as a complication of uveal and corneal disease.

In addition, many elderly leprosy patients are blind as a result of age related cataract. This may not be directly related to leprosy, but because of leprosy, these patients often have less access to surgery.

Whereas corneal involvement occurs in both types of leprosy (paucibacillary and multibacillary), iridocyclitis is characteristic of multibacillary disease. This, and differences in age at disease recognition, probably account for regional differences, i.e., corneal disease in Africa and the Indian subcontinent where paucibacillary disease predominates, and iris involvement in East Asia and South America where multibacillary disease predominates.

Ocular leprosy represents a considerable source of avoidable blindness, which can be greatly reduced by early detection of patients at risk, and appropriate management. This calls for intensified efforts in the training of health personnel and patient education and integrating leprosy and ex-leprosy patients into general eye care services.

CHAPTER 1

OCLUAR LEPROSY AS A GLOBAL CAUSE OF BLINDNESS

Multidrug therapy (MDT) has greatly reduced the incidence of eye disease in leprosy. Nevertheless, people who have leprosy or who have had leprosy in the past (referred to here as ex-leprosy patients), continue to have eye complications as a result of the disease or as a result of other causes, such as cataract.

The lack of reliable details on total numbers of people affected by leprosy, together with the great variation in the frequency of eye complications in different populations, continues to make estimation of the prevalence of blindness and ocular involvement in leprosy difficult. The prevalence of eye disease in ex-leprosy patients varies considerably, primarily as a result of variations in previous anti-leprosy treatment, the condition at leprosy diagnosis, and the age of the patient.

A review of the world literature shows wide variation in the methods, planning, setting up and reporting of ocular leprosy surveys. Many studies taken from leprosaria have a predictably high prevalence of eye disease. Even the definition of blindness and the evaluation of ocular manifestations in respect of visual impairment have not been sufficiently standardised to allow firm conclusions to be drawn from these studies.

Meaningful estimates of the prevalence of blindness among people affected by leprosy are further hindered by regional variability of case management procedures. Ocular disease is, not surprisingly, a function of disease duration. The duration of disease at diagnosis may vary according to health service coverage, the level of awareness of the disease, and the social stigma of leprosy.

At the time of diagnosis, ocular disease due to leprosy is not uncommon; approximately 11% of people with multibacillary (MB) leprosy (from the LOSOL study in Ethiopia, India, and the Philippines) have lagophthalmos, uveitis, or trichiasis related to their disease at diagnosis. These conditions will remain after MDT and put the person at risk for blindness in the future; this is of particular concern if the person is discharged from the health care system with no provision for follow up. In these populations the primary predictors of leprosy related eye disease were older age, the presence of other disabilities and reactions involving the face.

Research from the LOSOL study has provided, for the first time, reliable data on the incidence of eye disease in MB patients during MDT. During two-year MDT around 2% of MB patients developed lagophthalmos and 7% developed uveitis. Research on the incidence of ocular disease following completion of MDT suggests that uveitis continues to develop. There is no data on the incidence of eye problems among paucibacillary patients during or after MDT, although it is presumed to be much lower than among multibacillary patients.

CHAPTER 2

THE CLINICAL DISEASE

Changes in the eyelids

In order for the eyelids to protect the eye by spreading tears and clearing the cornea of debris, they must have the necessary rigidity, the correct curvature and the proper lid margin apposition. They must be able to open and close under voluntary control, perform spontaneous intermittent blinking, and respond with a defensive blink reflex.

In leprosy a considerable number of patients, whatever the clinical type of the disease, are at risk of developing lagophthalmos. For the patient who develops a reversal reaction, and who already has skin involvement of the face, in particular in the area overlaying the facial nerve, lagophthalmos may develop early in the disease and has a sudden onset. Unless intervention with systemic steroid treatment is prompt, much of the orbicularis oculi function may be lost.

Without anti-leprosy treatment, multibacillary patients develop paresis later in the disease and they often have corneal sensory loss by that time. These patients then have little or no urge to blink, nor can they do it adequately with voluntary effort. They are at high risk and require early surgical intervention to avoid corneal damage. In some longstanding MB cases corneal sensory loss (and exposure keratitis) can occur unrelated to lagophthalmos.

Lagophthalmos generally develops either before or within six months of the start of treatment and in relation to a reversal reaction. Development of lagophthalmos during the later course of anti-leprosy treatment is not common; the incidence of lagophthalmos is generally less than 1% per year. Most of the lagophthalmos in leprosy is the result of nerve damage affecting the zygomatic and temporal branches of the VIIth cranial nerve. In addition multibacillary patients may have destruction of the delicate marginal and pretarsal fibres of the orbicularis oculi muscle due to infiltration by *Mycobacterium leprae*.

Since the branches of the VIIth nerve are randomly involved, the extent of the resulting paresis is variable. Many observers note that the lower lid is commonly affected first, especially the marginal fibres. The characteristic effect is a slack, drooping lower lid, exposing the sclera inferior to the cornea (ectropion), a condition that interferes with adequate support of the precorneal tear film (Figure 1).

Paresis of the pretarsal muscle (in the upper lid) results in exposure of the cornea in sleep. Paresis of the peripheral, strong preorbital part of the orbicularis muscle may occur but is not common (Figures 2,3). By using this part of the muscle many patients are able to achieve closure by deliberate forced effort even though there are serious deficiencies in closure during sleep and lack of the protective defensive blink. The eye is undoubtedly at risk, but providing that sensation is adequate, the cornea may remain remarkably healthy.

Infiltration of the skin and other lid structures by *M. leprae* results in further significant changes, in addition to the nerve and muscle damage and resulting lagophthalmos:

1. Loss of elasticity of the skin with premature accentuated dermatochalasis and heavy, drooping, upper lids. The weight of skin may cause an in-turned eyelid margin (entropion) and trichiasis may result.
2. Atrophy and stretching of the canthal tendons contributes further to the condition of ectropion of the lower lid margin.
3. Atrophy of the tarsal plate, which results in thin floppy lids that are less efficient in spreading tears and cleaning the cornea.
4. Atrophy of tissues supporting the eyelash follicles may result in the loss of eyelashes, while the remaining lashes tend to hang against the cornea or bulbar conjunctiva. The remaining lashes are often short and atrophic. With severely impaired corneal sensation, the patient ignores the situation. In those patients whose sensation is less impaired the discomfort of the lashes may be interpreted as an 'itch'. The patient will be tempted to rub the eye with calloused, insensitive and often infected fingers. The cornea may be damaged and ulcerate.
5. Meibomian glands may become infiltrated and secondarily infected, with atrophy as the ultimate result. This may contribute to the poor quality of the tear film seen in many patients with long-standing disease.

Medical management of lagophthalmos

With early and effective anti-leprosy treatment, serious damage to the eyelids can be largely averted. However health workers should keep in mind the risk of reversal reaction, affecting the VIIth cranial nerve and causing extensive motor loss. Patients with pre-existing patches in the face are at particular risk (Figure 6).

Prompt intervention by means of systemic steroids can prevent permanent damage in those cases and so help to safeguard the cornea. Recent facial nerve damage, with a duration of less than 6 months should also be treated with systemic steroids, as should any recent nerve damage in leprosy. A recommended semi-standard regimen for systemic steroids is as follows:

A starting dose of 40 mg of prednisolone daily for 2 weeks would be followed by a decrease by 10 mg every two weeks until 20 mg is reached. Thereafter, decrease the dose by 5 mg every 2 weeks. The total duration of the course is 12 weeks. The starting dose may be increased if no improvement occurs within the first few days. In addition, exercises, 'Think blink' and corneal protection devices (such as sunglasses) may be necessary.

Surgical management of lagophthalmos

Lagophthalmos surgery should be provided to patients who need it. Evaluation of the need for lagophthalmos surgery should be based on one or more of the following conditions: size of lid gap, corneal exposure, corneal hypoesthesia, visual acuity, and/or cosmetic difficulties. Permanent tarsorrhaphy has been used frequently, but the result may be cosmetically unacceptable to the patient. The loss of the temporal field of vision is a disabling side effect of a temporal or lateral tarsorrhaphy. There are a number of other comparatively simple surgical procedures being used for lagophthalmos surgery. An appropriate procedure in many situations is the modified lateral tarsal strip procedure (Annex 3), but there is little evidence to support the superiority of any one procedure. Regardless of the procedure, with time, surgical failure becomes more likely: patient education and follow up of surgical cases is strongly encouraged. Standardised routine monitoring of the outcome of lagophthalmos surgery is recommended. (Annex 2)

Trichiasis

Trichiasis is not an uncommon finding in leprosy patients; it has been recognized in 1% of MB patients at the time of their disease diagnosis (Figure 5). Among ex-leprosy patients the incidence of trichiasis was approximately 1% per year. Trichiasis has been shown to be responsible (along with lagophthalmos) for incident corneal disease in leprosy patients. Trichiasis in leprosy may be due to loss of support of lash follicles, secondary to infiltration by *M. leprae*. Eyelid ptosis, associated with laxity in the pretarsal tissues, may also be the underlying cause of trichiasis in many leprosy patients. Surgical management (rather than epilation) of trichiasis is recommended in most cases, particularly those in which irritation is noted.

Corneal changes

The major corneal change in ocular leprosy is exposure keratitis due to lagophthalmos, in particular in combination with reduced or absent corneal sensation (Figure 2). To a lesser extent, corneal damage may be caused by trichiasis. The insensitive and unprotected cornea can be readily damaged by foreign bodies and drying. Exposure of the cornea to drying can result in destruction of the corneal epithelium. The early stages can be recognized by fine punctate superficial lesions on the cornea, usually in the lower outer part of the cornea. Secondary bacterial infection or a foreign body may subsequently cause a corneal ulcer. Chronic infection of the tear sac (dacryocystitis) is an aggravating factor, potentially leading to bacterial corneal ulcers.

Protection must be provided to those patients with lagophthalmos by any means effective in narrowing the aperture between the eyelids and keeping the cornea lubricated. Active exercises may be helpful in improving lid function. There should be frequent use of tear substitute drops if these are available, and ointment or oily drops at night. Sunglasses and other protective devices are also very helpful. Surgery for lagophthalmos should be provided when the surgeon judges that the cornea is in danger, as per the guidelines above. A corneal ulcer must be treated immediately with an antibiotic eye ointment. The patient may need to be referred for further specialist treatment and/or surgery.

Reduced corneal sensation can also contribute to corneal ulceration, although this has not been carefully studied. Although it is not completely reliable, corneal sensation can be determined by the use of a clean wisp of cotton-wool. This need not be done routinely: irregular or absent blinking in a patient without lagophthalmos also may indicate decreased corneal sensation. The cornea is touched with the cotton and the patient's absence of a blink response or denial of feeling the touch is recorded. Patients with reduced corneal sensation are at higher risk of corneal ulceration and erosion, as there may be no pain as a warning sign. A temporary central tarsorrhaphy may be necessary to get the cornea to heal. Once the cornea has healed a more cosmetically acceptable procedure can be done. Corneal scarring can be recognized with the aid of a torch, and its effect on vision is determined by its location.

Other less common corneal problems in untreated, multibacillary patients with high bacillary loads, include avascular punctate keratitis (Figure 8), pannus, corneal beading and limbal lepromas. Avascular (not to confused with 'fine punctate superficial lesions' mentioned previously) punctate keratitis first appears as faint, discrete superficial opacities in the upper, outer quadrant of the cornea.

Histologically they consist of clumps of bacilli-laden cells. They may become dense white tiny opacities resembling specks of chalk-dust. As the disease progresses, they may coalesce to form a diffuse haze. This keratitis is usually asymptomatic, the eye remaining white. Later, blood vessels may grow into the cornea, and fresh lesions develop alongside the vessels to form lepromatous pannus.

Beading of nerves in the periphery of the cornea appears as focal areas of thickening of the nerves with high magnification. This sign is pathognomonic of leprosy, but not necessarily correlated with reduced sensation. A limbal leproma is a nodule, usually arising from the ciliary body; the pupil is often drawn to the side of the leproma. It may grow to encroach on the cornea. These lesions have become rare since the earlier diagnosis of leprosy and the universal use of MDT.

Iris Involvement

The frequency of uveal involvement in leprosy varies considerably in published series and in different countries. The interpretation of reports is made difficult by the lack of standardisation of examination techniques and recording. However, recent research using standard recording has shown a similar frequency in multibacillary patients in Asia and Africa, once other demographic factors, age in particular, are controlled for. The iris may be involved in leprosy either in the acute form of iridocyclitis, which occurs as part of the ENL (Erythema Nodosum Leprosum) reaction, or as a chronic process. The acute form is not different from any other acute iridocyclitis, causing pain, photophobia and pericorneal redness (Figure 7). Often a severe uveitis may cause so much diffuse redness that it seems to also be a scleritis. The treatment is topical application of atropine and steroids, which should be administered immediately to avoid complications.

Episcleritis also commonly occurs as part of the ENL reaction in leprosy. Episcleritis is an inflammation of the elastic connective tissue beneath the conjunctiva and above the white sclera. There is a localized area of diffuse redness, which may be painful and locally tender (Figure 9).

A chronic insidious form of iridocyclitis may occur in multibacillary leprosy, especially in those who had a long period of inadequate treatment prior to starting MDT. The chronic iridocyclitis will tend to lead to iris atrophy and a small pupil (Figure 10), and these patients may become blind because of the combination of a small pupil and mild corneal changes or cataract in the visual axis.

Once iris atrophy and a small pupil are recognized, it has often been recommended that this be treated long term with topical atropine or phenylephrine in an attempt to stimulate pupillary dilation. It is not clear, however, how useful this is. When cataract accompanies the small pupil, it should be removed. Since these 'complicated cataracts' pose a surgical challenge, they should be operated by experienced ophthalmologists in centres with adequate facilities to deal with the challenge.

Cataract

A cataract is an opacity or cloudiness of the lens, reducing vision and (when very advanced) causing the pupil to appear grey or white (Figure 4). Cataract is the leading cause of blindness in leprosy affected persons, probably responsible for over 75% of incident blindness. Cataract occurs with increasing age; the risk of cataract is 2.5 to 3 times more common in MB leprosy (or ex-leprosy) patients with evidence of chronic uveitis. In an individual patient, however, it is often not possible to determine whether or not the cataract is due to leprosy, or is simply age related.

Cataract is treated surgically by removing the cloudy lens and preferably replacing it with a synthetic intraocular lens (IOL). Although cataract surgery can be done without an IOL, the visual benefit is very much less. Research shows that cataract surgery with IOL implantation, even in patients with evidence of chronic uveitis, can be done safely and will provide a good quality outcome. In cases with longstanding chronic uveitis, the surgery will be more challenging; nonetheless, IOL implantation, where available, should be promoted among leprosy patients who need cataract surgery. In most cases timely removal of a visually disturbing cataract and implantation of an IOL will lead to a better outcome than waiting until the cataract is very mature. High quality surgery can only be ensured if people with leprosy are accepted into the general eye care services. Routine assessment of the outcome of cataract surgery is strongly recommended. Education of health workers (including eye care staff) is required to ensure that leprosy patients gain access to eye care facilities.

CHAPTER 3

ACTIVITIES FOR PREVENTION OF BLINDNESS

IN LEPROSY

People need not go blind from leprosy. For the primary prevention of blindness, early detection and systemic treatment of leprosy are of utmost importance. Leprosy Elimination Campaigns (LECs) have been successful in mobilizing community involvement and reducing the stigma associated with leprosy. Eye care for leprosy and ex-leprosy patients must be included in district/region based VISION 2020 plans. Integration of leprosy and eye care will reinforce and complement VISION 2020 initiatives and strengthen leprosy control activities. Integration of leprosy into VISION 2020 plans must be accompanied by education of district and regional eye care staff to reduce the stigma associated with the disease and to strengthen their ability to provide high quality eye care services.

Leprosy patients and ex-leprosy patients with disabilities form a distinctly disadvantaged group. Disability due to deformities of the extremities receives attention because it is obvious, but ocular morbidity may be overlooked. In many developing countries, leprosy patients also receive a low priority in obtaining eye care in the general ophthalmic service. This is because of their generally low socioeconomic level and the stigma of leprosy. Nonetheless, it is critical that leprosy patients (during their anti-leprosy treatment and after release from treatment) be integrated into general health and eye care programmes. Only in this way can they be assured of receiving acceptable quality eye care, particularly for treating cataract. Integration will require close collaboration between leprosy control and prevention of blindness programmes. At the national, regional, and local levels strong political commitment (including professional organisations) is needed to integrate leprosy patients into general health and eye care programmes.

Further steps that are needed include the creation of explicit guidelines and instructions on eye care in leprosy within national leprosy programme manuals. In planning for Prevention of Disability (POD), guidelines as well as budgets for implementing eye care activities are required. A chapter on prevention of blindness in leprosy should be included within manuals and guidelines for eye care staff in national prevention of blindness programmes.

Present action in eye health care

An integrated primary health care approach to blindness prevention has been developed in many countries with 'primary eye care' as one of its cornerstones.

This implies provision of simple eye care at the community level by trained health workers, together with basic health education for the promotion and protection of eye health. This approach is equally valid for cases of eye disease due to leprosy.

Primary eye care can be divided, from a management point of view, into several categories of action:

- Recognition and referral of visual impairment or blindness
- Recognition and treatment of common and simple disorders, such as conjunctivitis and superficial foreign bodies
- Recognition, initial treatment and referral of some conditions such as lagophthalmos and corneal ulcers
- Recognition and referral of remaining cases, such as painful red eyes and sudden loss of vision.

The primary eye care scheme needs continuous support from higher levels of the health services, in order to provide timely and appropriate care of referred cases. There is a need for refresher courses and supervision of the workers providing primary eye care, if deterioration of the work being performed is to be avoided.

The intermediate level of eye care is usually found in eye departments or in special clinics of district and provincial hospitals. At this level either trained ophthalmic assistants or medical officers (or possibly, ophthalmologists) are usually available.

The tertiary level of eye care is normally found in university clinics or major hospitals. Experience has shown that whereas a primary eye care scheme can be relatively easy to set up at the periphery, the problem is maintaining adequate support and supervision and ensuring that there is sufficient capacity to deal with all referred cases at the intermediate level.

Present action in leprosy control

Leprosy control is carried out at the country level in a variety of ways. Some programmes still function as vertical services, while others are completely integrated within the primary health care services. Most programmes conduct leprosy control through various combinations of the two approaches. Globally, the general trend is to integrate leprosy control into primary health care services.

The present activities related to ocular leprosy are generally unsatisfactory in control programmes, whether vertical or integrated. The training given on ocular leprosy, including its prevention and management, is rather limited even for personnel meant for specialised leprosy services. Further, leprosy institutions or hospitals, which act as referral points often do not have sufficient technical or material resources to deal with the problems of ocular leprosy effectively. While the referral services available at general ophthalmic centres are capable of dealing with many of the ocular leprosy problems, the services very often are not available or accessible for leprosy patients. This is part of the problem of the non-acceptance of leprosy patients in general health services. Another dimension of the problem is the low priority that leprosy and its ocular manifestations receive within the undergraduate medical curriculum.

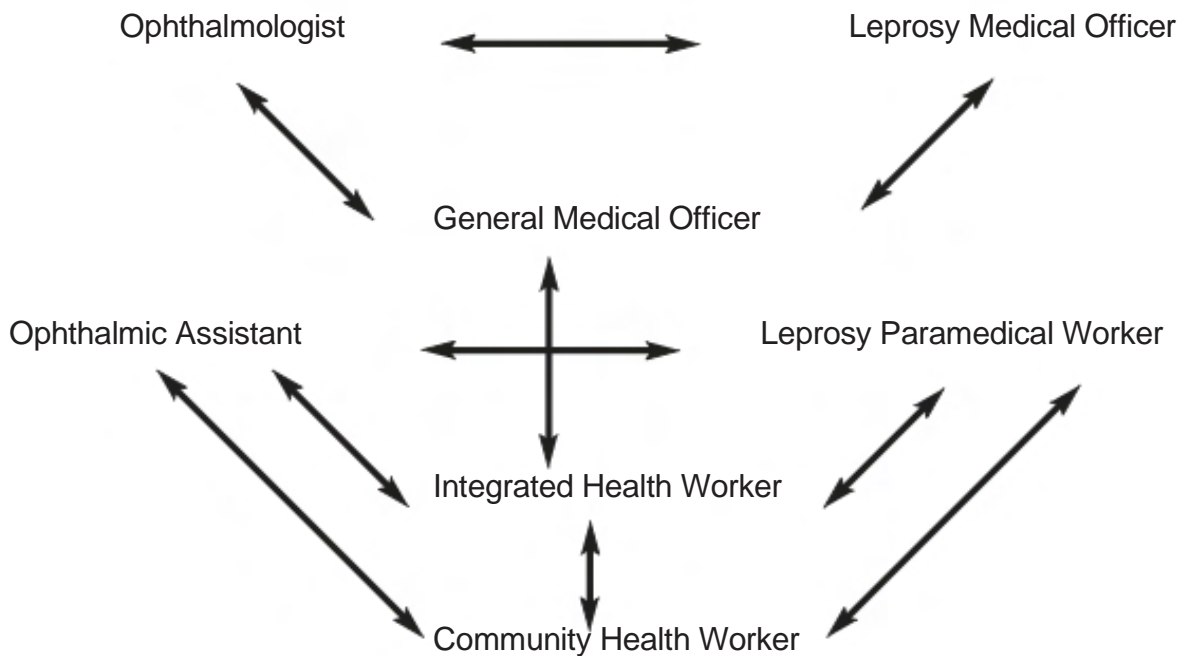
Co-ordination of activities

Ocular leprosy should be a component of integrated health care, leprosy control, and prevention of blindness programmes. In order to make the best possible use of available resources, it is important to co-ordinate carefully the management of patients with ocular leprosy. Ophthalmologists and other staff involved in the provision of eye care should be better trained in the diagnosis and treatment of ocular leprosy and motivated to care more for those patients. Opportunities should be provided for ophthalmologists to visit leprosy centres, and to assume responsibility for the care of patients with ocular leprosy. Training in the recognition and treatment of ocular complications from leprosy should be included in the undergraduate and postgraduate programmes. Such programmes should include clinical teaching with examination of patients with ocular leprosy in general eye clinics. Surgical intervention (primarily for cataract and lagophthalmos) should be an integral part of training and treatment programmes. Ultimately, the quality of eye care received by those affected by leprosy will not be better than the quality available to the general population; therefore it is to the benefit of leprosy patients that general eye care programmes be supported.

A training component that addresses the skills and activities of health workers in relation to care of eyes in leprosy should be introduced into national VISION 2020 and leprosy control plans. The plan should address the needs at different levels and should include the needs of existing health workers through supplementary courses, and of health workers currently in training through medical, nursing and paramedical curricula. In every setting with a leprosy control programme, a practical referral system needs to be clearly defined.

Workers at all referral points need to be educated regarding the eye care needs of leprosy patients. Integrated health workers or leprosy paramedical workers should be trained in the recognition of ocular leprosy and to perform regular screening of patients, to identify those in need of treatment or referral.

The diagram below illustrates the various possibilities for interaction at different levels between the health personnel concerned. It should be noted that all these categories of staff may not exist as separate individuals, e.g., an integrated health worker may well fulfill the functions of a leprosy paramedical worker in an integrated programme.



Recommended activities

At the time of leprosy diagnosis all patients should be examined for lagophthalmos (any gap in mild closure), visual acuity, the red eye, and presence of a facial patch. All people with lagophthalmos, decreased vision, persistent red eye, and/or a facial patch in reaction should be referred by the basic health worker to a higher level for clinical evaluation, or as per guidelines in the national leprosy control and prevention of blindness programmes.

At the end of anti-leprosy treatment all patients must be educated regarding the risk of eye disease and informed that they should return for examination if they develop lagophthalmos, diminished vision, a red eye, or a facial patch in reaction.

Explicit instructions regarding referral must be given to each discharged patient. All patients with lagophthalmos should receive continued periodic follow up.

In settings where there are leprosy colonies/villages it is recommended that annual (as a minimum) screening eye examinations and treatment be conducted. Furthermore, patients in 'care after cure' programmes should have, as a minimum, annual eye care examinations and management.

There are many barriers that prevent patients from accepting lagophthalmos surgery or for accepting cataract surgery, which need to be identified. They can be broken down sequentially, as follows:

- **Awareness** (knowledge of the availability of surgery, the surgical location, the cost of surgery, and the anticipated outcome of surgery)
- **Accessibility** (affordability of surgery, distance to surgical facility, provider acceptance of leprosy patients, quality of surgical outcome)
- **Acceptance** (family willingness to support surgery, family willingness to provide assistance to seek surgery, fear of surgery, fear of a poor outcome)

Information on specific barriers is important to properly promote cataract and lagophthalmos surgery to patients and their families. The barriers will be different for lagophthalmos and cataract, and will be different for men and women. Promotion activities need to be gender-sensitive.

Disability grading in leprosy

There have been many revisions to the WHO leprosy disability grading scheme; the current WHO grading scheme for eye disabilities is impractical for most programmes and is rarely implemented. Accordingly, it is recommended that visual acuity (either visual impairment [visual acuity <6/18] or blindness [visual acuity <6/60], depending upon the setting) and lagophthalmos should become the primary indicators for monitoring disability (grade 2) and that corneal hypoesthesia, corneal opacities, and uveitis should be removed from the leprosy disability grading scheme. These latter conditions are more difficult for health workers to detect reliably, although an ophthalmologist may consider them in determining appropriate treatment for a given patient.