INCIDENCE OF OCULAR MANIFESTATIONS IN TYPE OF LEPROSY: A CLINICAL STUDY

D. Satyavardhana Rao[1]

[1]*Assistant Professor, Department of Ophthalmology, Sri Venkateswara Medical College, SVRR Government General Hospital, Tirupati.*

ABSTRACT: Blindness due to leprosy can be better prevented than cured once it sets in proper screening of Hansen's patients and prompt institution of therapy admixed with gentleness and kindness go a long way in achieving this end. The incidence, severity and morbidity vary from place to place and between various types of leprosy. The eye is involved in all forms of leprosy more in lepromatous than tuberculoid leprosy. The clinical presentation depends on duration of disease, distribution of patients according to age, sex, percentage of ocular involvement with type of leprosy and incidence of blindness are briefly reviewed.

KEYWORDS: Classification of leprosy.

HOW TO CITE THIS ARTICLE: D. Satyavardhana Rao. "Incidence of Ocular Manifestations in Type of Leprosy: A Clinical Study". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 45, November 05, 2015; Page: 8183-8189, DOI: 10.18410/jebmh/2015/1101

INTRODUCTION: Leprosy is an infective disease of phenomenal chronicity caused by mycobacterium leprae. It primarily affects peripheral nerves and skin Mycobacterium leprae does not affect central nervous system. The pathos of its debilitating effect equaled by the psychological trauma of being considered as a social outcast.[1] Contacting leprosy is unfortunate for patient, and then the onset of blindness on such an individual is a disaster. In case of lepers who are deprived of their cutaneous sensation, deformities of limbs, loss of vision is at the same time both a tragedy and incapacitation. This, points to the importance of vision in Hansen's patients which can be preventable.

Dr. G. H. Armuer Hansen, a Norwegian scientist in 1873 has opinioned that Mycobacterium leprae was the causative agent of leprosy, which was confirmed by Neisser of Germany in 1879, Brack of France in 1885, Leloir in 1886 and Bessnier in 1887. Mycobacterium leprae is a schizonticide of the order Actinomycetale and of the family Mycobacterium. They are straight or slightly curved Gram positive rods ranges from 1.5 to 8 microns in length and 0.2 to 0.5 microns in width. The organism frequently occurs in glomerations known as "Globi" which have the appearance of tightly packed bundles of cigars.

BACTERIOLOGY: Leprosy is caused by mycobacterium leprae which is an obligate intracellular acid fast bacillus multiply mainly inside the macrophages of the skin (histiocytes) and of the nerves (Schwann cells) M. lepra is less acid fast than M. tuberculosis. Leprosy bacilli are pleomorphic, straight or curved rod like gram positive bacteria. They may appear ovoid, fragmented or granular. They are no motile, non sporing about the size of 3microns x 0.3microns.

With zeihl-neelsen stain it is less strongly acid fast than the tuberculous bacillus. In the stained skin smears they are seen lying singly, in clumps or in compact masses known as globi. In smears stained with zeihl-neelsen method, the bacteria appear as bright pink rods with rounded ends and uniformly stained. Leprosy bacilli are scanty in lesions of paucibacillary leprosy but are present in enormous numbers in lesions of multibacillary leprosy. One gram of lepromatous tissue may contain as many as 7000 million leprosy bacilli.

CULTURE: Although the discovery of lepra bacilli was reported as early as 1873, they could not yet grown in artificial culture media. It has been cultivated by Shepard in 1960 by infecting foot pad of mice. The generation time of M. leprae in foot pad of mouse is 12-13 days. The lepra bacilli ar also cultured in 9 banded armadillo.

Pathophysiology: The exact mechanism of leprosy is unknown. The bacteria can also be grown in the laboratory in foot pads of mice and in armadillo. It is estimated that only 5% of the population is susceptible to leprosy due to genetic factors. This is mostly because the body is naturally immune to the bacteria and those persons who become infected are experiencing several allergic reactions to the disease. In addition, malnutrition and prolonged exposure to infected persons may play a role in development of overt disease.

The incubation period of leprosy bacilli is between 2 to 10years. (Average being 3-5yrs)

Two exit routes of M. Leprae from human body are the skin and nasal mucosa. It is true that lepromatous cases show large no. of organisms deep down in the dermis. In a recent study, Job et al found large number of M. leprae in superficial keratin layer of the skin of lepromatous leprosy

Submission 16-10-2015, Peer Review 17-10-2015,
Acceptance 24-10-2015, Published 05-11-2015.
Corresponding Author:
D. Satyavardhana Rao,
Elite Hospitals,
D. No. 10-14-57616, Opp. Municipal Office,
Reddy & Reddy Colony,
Tirupati-517501, Andhra Pradesh.
E-mail: dsvrao1968@gmail.com
DOI: 10.18410/jebmh/2015/1101

patients suggesting that the organism could exist along with the sebaceous secretions.

The importance of nasal mucosa was recognized as early as 1898 by Shaffer particularly that of ulcerated mucosa. The quantity of bacilli from nasal mucosal lesions in lepromatous leprosy was demonstrated by Shepard as large with counts ranging from 10,000 to 10,000,000. pedley reported that the majority of lepromatous patients showed leprosy bacilli in their nasal secretions as collected through blowing the nose. Davey and Rees indicated that nasal secretions from lepromatous patients could yield as much as 10 million viable organisms per day.[1] In summary, entry through respiratory route appears the most probable route, although other routes particularly broken skin cannot be ruled out.

CLASSIFICATION OF LEPROSY:

1. The world health organization system distinguishes "Paucibacillary" and "Multibacillary" based upon proliferation of bacteria.
2. The Ridley-Jopling classification provides five gradations.

OCULAR MANIFESTATIONS OF LEPROSY: Ocular lesions of leprosy can be classified in to 4 categories.

1. Lesions following direct invasion of the eye by mycobacterium leprae.
2. Inflammatory lesions consequent to sensitization of ocular tissue to M. Leprae antigens and due to formation of intravascular immune complexes.
3. Secondary lesions following granulomatous infiltration of V&VII cranial nerves.
4. Secondary lesions following granulomatous infiltration of contiguous structures i.e. Eyebrows, Eyelids, lid glands, lacrimal drainage system.

1. **Lesion following direct invasion of the eye by M. Leprae:** M. Leprae invade the eye only on lepromatous end of spectrum. The organisms are generally blood borne and therefore generalized affecting both eyes almost equally. The tissues affected are from the anterior segment of eye since M. Leprae is known to invade and multiply in the cooler regions of the body which may account for the selective in lepromatous disease is the absence of reaction to M. Leprae and their unhindered growth, so unlike that evoked by M tuberculosis.

CORNEA: The three common lesions of cornea are;

1. Thickening and beading of corneal nerves.
2. Superficial punctuate Keratitis.
3. Interstitial Keratitis.

The cornea is richly supplied by nerves from the nasociliary branch of ophthalmic division of 5th cranial verve and has no blood supply. These two peculiarities aid detection of thickening and beading of the corneal nerves on slit-lamp and this is considered to be common and characteristic presenting sign of early leprosy. Since there are no blood vessels in the cornea, the organism invade the structure only by direct extension from surrounding structures. Some believe that the bacilli may move in along the nerves and form micro nodular swellings. Since the cornea is transparent these changes are detected early when they appear in the upper outer quadrant as faint discrete and later dense white grains of chalk. These are called corneal pearls, appearing in other parts of cornea, these form diffuse superficial punctuate keratitis. These lesions are characteristic of lepromatous leprosy. As lepromatous leprosy advances, the corneal lesions get aggravated. The cornea gets vascularised and lepromatous granuloma form in the ciliary body or in the episclera. Macrophages containing M. leprae aggregate around invading capillaries forming perivascular microgranulomas. The granuloma may infiltrate deeper in to the stroma forming interstitial keratitis which may seriously effect vision.

CILIARY BODY AND IRIS: Lepromatous irido-cyclitis as one of the commonest causes of blindness in leprosy. With bacillemia a common feature of leprosy and iris and ciliary body being highly vascular. It is highly likely that they are infected by haemotogenous route. The sphincter muscles of the iris which are surrounded and infiltrated by lepromatous granuloma gradually undergo destruction. Miliary lepromas or iris pearls near the papillary margins which are spherical yellowish opaque micronodules up to 2mm in size, are said to be pathognomonic. There are small clumps of macrophages packed with M. Leprae. The anterior surface of the iris when infiltrated by lepromatous granuloma ulcerates and loses its lining layer of fibroblasts and melonocytes thus exposing the foam cells to the anterior chamber.[2] Impairment of autonomic nerves supplying the iris and ciliary body cause early dysfunction of papillary muscles. The granulomatous lesion of the iris with ulceration may produce an exudates composed of fibrin and polymorphs and the papillary margins may adhere to the anterior capsule of the lens causing posterior synaechiae. The constricting action of the sphincter muscle may already have been lost resulting in a fixed, narrow, non-reacting pupil.

Eventually, destruction of the tissues of iris and ciliary body causes atrophy and shrinkage of the globe known as phthisis bulbi. Usually the granulomatous inflammation resolves with antileprosy treatment, but in some cases there may be continued presence of inflammatory cells resulting in persistent chronic silent iritis. Further the chromic inflammation may be the result of persisting M. Leprae or its antigens and they may be responsible for maintaining the disease process.

CONJUNCTIVA: A mild conjunctival inflammation with edema and dilated blood vessels may be seen pterygium with collections of macrophages containing M. Leprae has been reported.

EPISCLERA AND SCLERA: Episcleral and sclera involvement is common in untreated lepromatous patients presenting with nodule up to 5mm in diameter at the sclerocorneal junction. Scleretis is mostly seen in advanced untreated lepromatous patients and may weaken the globe.

POSTERIOR SEGMENT: The choroids and retina are not ordinarily involved in leprosy. There have been few anecdotal reports of extensions of lepromatous lesions from the ciliary body to the choroid which appear as minute nodular lesions.

CATARACT: Chronic irido-cyclitis may be responsible for the early formation of cataract. Steroids used in the treatment of lepra reactions may hasten the formation of sub capsular cataract.

2. **Inflammatory lesions consequent to sensitization of ocular tissue to M. leper antigens and due to formation of intravascular immune complexes:** Acute iridocyclitis is a common complication of erythema nodosum leprosum reaction. In this, there is exudates of polymorphs and fibrin in areas already having macrophage granulomas. This may aggravate the destructive granulomatous involvement of ciliary body and iris. Keratic precipitates of neutrophils and fibrin may be deposited on the anterior chamber. Acute uveitis has been an immune complex disease within uveal vessels but such a pathogenesis is unclear.
3. **Secondary lesions following granulomatous infiltration of trigeminal and facial nerves:** Involvement of ophthalmic branch of V cranial nerve produces impairment of sensation on parts of face including conjunctiva and cornea. Corneal sensory involvement for some unknown reason is essentially partial. Infiltration of VII more frequently zygomatic branch may produce paralysis of orbicularis oculi that closes the eyelids. This impairment also is found to be partial. In polar lepromatous leprosy involvement of both V & VII cranial nerves in bilateral but total paralysis is rare. In borderline leprosy undergoing upgrading reactions bilateral and fairly complete involvement of the VII nerve is seen. In tubercular types the involvement of both nerves is usually unilateral and depends on location of the skin lesion. The V nerve involvement results in impairment of corneal sensitivity predisposing to corneal ulcers. If only VII nerve is involved, there is classical lagophthalmos.[3,4] Severe involvement of the nerve results in permanently open lids and the centre of the cornea and its lower portion are exposed to wind and dust. This combined with absence of blinking, leads to dryness of corneal epithelium making it prone to ulceration. This is known as exposure keratitis. If both V and VII nerves are involved, pathological changes in the cornea are seen including secondarily infected corneal ulcers.
4. **Secondary lesions following granulomatous infiltration of contiguous structures (eyebrows, eyelids, lid glands, lacrimal drainage system):** The eyebrow, starting from lateral aspect may lose hair (madarosis) hair loss is due to hair root infiltration with lepromatious granuloma. Loss of eyelashes is not so common.[5] Lagophthalmos often causes ectropion and sagging of the medial side of the eyelid margin causing epiphora.

Bilateral granulomatous infiltration of the lacrimal and meibomian glands in lepromatous leprosy and lacrimal gland in tuberculoid leprosy is seen chronic dacryocystitis by secondary organisms and destruction of nasal bones resulting in obstruction of nasolacrimal duct may be observed.

CONCLUSION: The eye is involved in all forms of leprosy, more in lepromatous than tuberculoid leprosy considering the seriousness of eye complications, repeated and careful examination of the eye especially of those with lepromatous leprosy and those with nerve involvement affecting the eye cannot be overemphasized, especially since M. leprae can survive in iris and ciliary body long after skin lesions have become negative.

MATERIALS AND METHODS: The cases studied here were the inmates of S.V. Poor Home (a leprosy hospital under control of TTD) at Akkarampalli, Tirupati, patients who admitted in leprosy ward, patients who attended to ophthalmology O.P. and dermatology OP at S.V.R.R.G.G Hospital, Tirupati.

A total of 150 patients were studied for ocular involvement. Ocular lesions were found in 72 patients, more in lepreomatous leprosy followed by borderline leprosy and tuberculoid leprosy. Ocular changes were common in patients with duration of leprosy for more than 15 years. Madarosis and lagophthalmos were found to be major affections. Corneal involvement was seen in 28 patients and uveal tract involvement in 18 patients. No patient with posterior segment involvement was seen.

Each patient was subjected to detailed history taking followed by a detailed ocular and general physical examination, as per a set format patients were clinically divided into lepromatous, borderline and Tuberculoid types. A detailed study of 12 cases including systemic and local detailed examination has been presented in this study.

Examination of anterior segment structures was done in detail with help of slit lamp. The conjunctiva, cornea, anterior chamber, Iris, pupil and lens were examined for different findings. The detailed fundus examination where possible was done using both a direct and indirect ophthalmoscope. Recording of visual acuity and intraocular pressure was also performed.

RESULTS: Examination of adnexa and extraocular structures, included the examination of face, orbits, eye brows, eye lids, palpebral fissures, blink reflex, extraocular

muscles and bell's phenomenon, lacrimal sac, evidence of dry eye if any.

The study of 150 patients with leprosy revealed the following results.

Age Groups: Most commonly involved age group is 41-60yrs. Males are more commonly affected than females. Ocular involvement is more common in lepromatous leprosy.

OCULAR LESIONS: All the 10 cases of ectropion were seen in lepromatous leprosy. Among 4 cases of entropion 3 cases were seen in lepromatous leprosy and one case in tuberculoid leprosy. Trichiasis was seen in 8 cases of which 5 cases were seen in lepromatous leprosy and 2 cases in borderline group.

LACRIMAL SYSTEM: Among the complications of lacrimal system, 5 cases of chronic dacryocystitis were observed in lepromatous leprosy. It may dye to damage of the nasal cartilage secondarily causing chronic dacryocystitis.

d. Among conjunctival lesions, chronic conjunctivitis was seen in 4 cases.

3 cases were in lepromatous group, 1 case was seen in borderline group.

2 cases of pterygia observed in lepromatous group.

Scleritis and episcleritis were observed in 4 cases, out of which 2 cases were lepromatous type and 1 case of borderline leprosy. One case of intercalary staphyloma was seen in lepromatous type of leprosy.

Among 28 patients with corneal involvement, superficial keratitis was seen 8 cases corneal opacities in 15 cases, interstitial keratitis in 2 cases, adherent leucoma in 1 case. Corneal ulcer 0 cases and 2 cases of pannus were seen. All 28 cases had lepromatous form of leprosy. Out of 18 cases of uveal involvement 16 cases had chronic iridocyclitis and 2 cases had acute iridocyclitis. Complicated cataracts were encountered in 4 cases, 3 cases were from lepromatous group and 1 case from borderline group.

Although lagophthalmos was commonly encountered, (28.89%) majority of the patients were lucky to have positive Bell's phenomenon as protective mechanism and hence the incidence of exposure keratitis was relatively low (7.24%).

G. Other lesions:

- Iris atrophy – 2 cases.
- Ciliary staphyloma – 2 cases.

The total is more than the number of cases involved since mixed lesions were seen in many cases.

Blindness in this study was high, in spit that all the patients were receiving systematic antileprosy treatment. Late diagnosis of ocular changes, inadequate treatment of both ocular and systemic leprosy, ignorance along with poor socio economic conditions, social stigma and lack of regular supervision may be the contributing factors.

DISCUSSION: Eyes are commonly involved in leprosy, mechanism being infiltration of the tissues and damage to nerves. The involvement varies from 40-80% as quoted in various studies. The present study showed an incidence of 48% similar to other studies. The ocular involvement was found to be higher in lepromatous leprosy (75%) followed by borderline (16.66%) and tuberculoud leprosy (8.33%) in my study. Ocular complications appear to be more common among lepromatous patients than tuberculoid as anterior segment of the eye provides a favorable environment for M. leprae which are more numerous in lepromatous patients.[6,7]

This study observed madarosis as the commonest finding (58.33%). The other common eye affections included lagophtalmos (28.89%) ecrtopion (13.88%) scleritis & episcleritis (5.55%) corneal involvement (38.88%) uveal involvement (25%) complicated cataract (6.66%) which are in accordance with other studies.[8]

In the present study, percentage of blindness was 30.55% was in accordance with other studies – shield (1974) -33%, Malla et al (1981)[9] – 28%, courtright (1984)[10] -29.50% Herksin Tsai (1985) -31%.

The ocular involvement is directly related to the duration of disease. In this study the mean duration of illness was 15 years.[11] Those patients with longer duration of illness (>15 years) 75% had more severe involvement, multiple lesions and more mutilations.

In the present study, most of the patients were on antileprosy treatment and inspite of all patients undergoing sulfone mono or multidrug therapy, incidence of blindness was high. It may be due to delay in diagnosis as patients attend at late stage of ocular involvement. Although prompt institution of treatment and availability of newer an better antileprosy drugs has markedly improved the outcome of those affected, the process of ocular involvement continues not withstanding regular medical treatment.[12]

CONCLUSION: The eye is involved in all forms of leprosy, more in lepromatous than tuberculoid leprosy considering the seriousness of eye complications, repeated and careful examination of the eye especially of those with lepromatous leprosy and those with nerve involvement affecting the eye cannot be overemphasized, especially since M. leprae can survive in iris and ciliary body long after skin lesions have become negative.

BIBLIOGRAPHY:

1. Ffytche T. Blindness in leprosy a forgotten complication Aust NZJ, ophthalmology 1989, 17(3) 257-260.
2. Lamba PA. Santhoshkumar D. Arthanariswaran R, ocular leprosy, new perspective lepr India 1983; 55(3) 490-494.
3. Thompson KJ, Allardice. GM, Babu GR. Robbers. H, Kerketlaw, kerketta. F, Patterns of ocular morbidity and blindness in leprosy, a three centre study in eastern India, Lepr, Rev.

4. Ffytche TJ. Role of iris changes as a cause of blindness in lepromatous leprosy. British Journal of ophthalmology, 1981, 65 (4) 231-239.
5. Malla OK, Brand F. Anten GF. Ocular findings in leprosy patients in an institution in Nepal. British Journal of ophthalmology 1981, 65(4) 226-230.
6. Ticho U & I ben sira; British Journal of Ophthalmology 1970, 54; 107.
7. Dutta L.C, N.C, Dass; B.C. Chatterjee, D.N. Bujarbarna; J. Indian M.A. 1973, 61; 385-388.
8. Roger A, Hitchings. Documental ophthalmological proceedings series 22. Glaucoma symposium: Diagnosis and Therapy Amsterdam. British Journal of Ophthalmology, 1981, 65(3): 217.
9. Malla OK, Brandt F, Anten JGF. Ocular findings in leprosy patients in an institution in Nepal (Khokana) Br J Ophthalmol. 1981; 65: 226–230. doi: 10.1136/bjo.65.4.226.
10. Courtright P, R. Green; R. Pilarski J. Smucny. A survey of the eye complications of leprosy in South Korea. Lepr Rev. 1984, Sep;55(3), 229-37.
11. James HJ Allen; The pathology of ocular leprosy. American Journal of Ophthalmology 1966, 61; 987-992.
12. Emiru. V.P. Ocular leprosy in Uganda. British Journal of Ophthalmology 1970, 54; 740-743.

WHO	Ridley Jopling	Description	Lepromin test
Paucibacilly	Tuberculoid (TT) Borderline tuberculoid (BT)	It is characterized by one or more hypopigmented skin macules and anaesthetic patches where skin sensations are lost because of damaged peripheral nerves that have been attached by the human host's immune cells	Positive
Multibacillary	Mid borderline or borderline (BB)	Borderline leprosy is of intermediate severity and is most common form. Skin lesions resemble tuberculoid leprosy but are more numerous and irregular large patches may affect a whole limb and peripheral nerve involvement with weakness and loss of sensation is common. This type is unstable and may become more like lepromatous leprosy or may undergo a reversal reaction, becoming more like tuberculiod form	Positive
Multibacillary	Borderline lepromatous (BL) and lepromatous (LL)	It is associated with symmetric skin lesions nodules, plaques thickened dermis and frequent involvement of the nasal mucosa resulting in nasal congestion and epistaxis but typically detectable nerve damage is late	Negative

Age in years	No. of patients	Percentage (%)
10 - 20	3	03%
21 - 40	28	28%
41 - 60	54	54%
> 61 years	15	15%

Table 1: Distribution of patients according to the age

Majority of patients belongs to the age group of 41 – 60 years.

Total patients	Patients showing Ocular involvement	Percentage (%)
150	72	48%

Table 2: Patients Showing Ocular Involvement

Sex	No. of Patients	Percentage (%)
Male	48	66.66%
Female	24	33.33%

Table 3: Patients with Ocular Involvement According to Sex

Type of leprosy	No. of patients with ocular involvement	Percentage (%)
Lepromatous	54	75.00%
Borderline	12	16.66%
Tuberculoid	6	8.33%

Table 4: Type of Leprosy and Ocular Involvement

Less than 15 years		More than 15 years	
No. of cases	**Percentage (%)**	**No. of Cases**	**Percentage (%)**
18	25	54	75%

Table 5: Duration of Leprosy

Type of leprosy	No. of cases with madarosis	Percentage (5)
Lepromatous	32	44.44%
Borderline	8	11.11%
Tuberculoid	2	2.77%

Table 6: Madarosis in Various Types of Leprosy

The loss of eyebrows (Superciliary madarosis) and eye lashes (madarosis) was encountered in 58.33% of patients.

Lid Abnormality	No. of cases	Percentage (%)
Ectropion	10	13.88%
Entropion	4	5.55%
Trichiasis	8	11.11%

Table 7: Lid Lesions

Type of involvement	No. of cases	Percentage (%)
Corneal involvement	28	38.88%
Uveal involvement	18	25%
Complicated cataract	4	6.66%

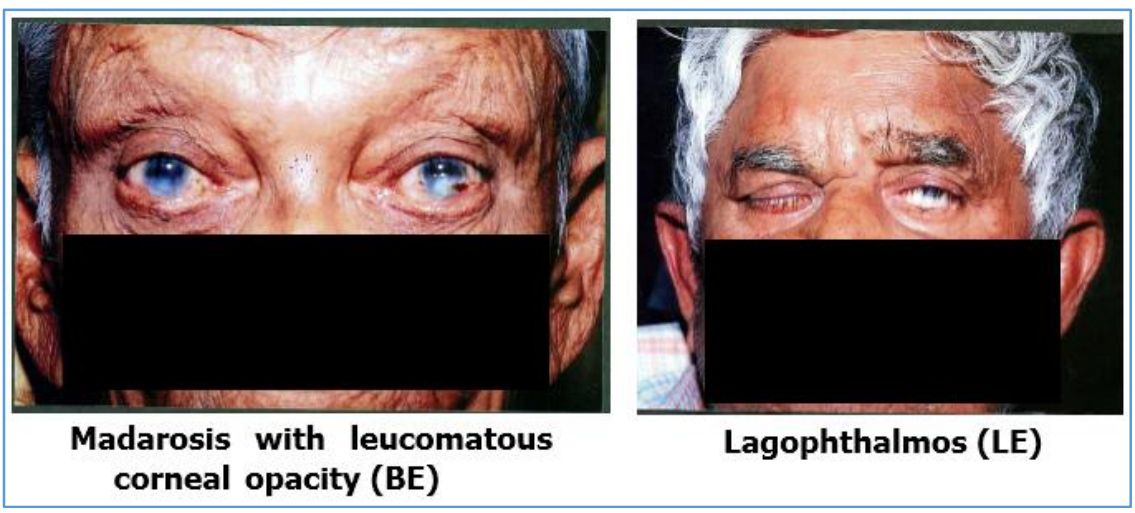
Table 8: Sight threatening lesions

Type of leprosy	No. of cases	Percentage (%)
Lepromatous	13	18.06%
Tuberculoid	04	6.66%
Borderline	03	4.17%

Table 9: Incidence of Lagophthalmos According to the Type of Leprosy

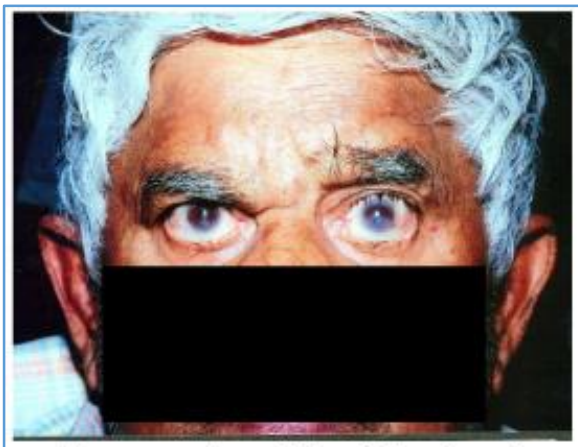
Type of involvement	No. of patients
Iridocyclitis	12
Exposure keratitis	4
Corneal opacity	8
Interstitial keratitis	2

Table 10: Incidence of Blindness

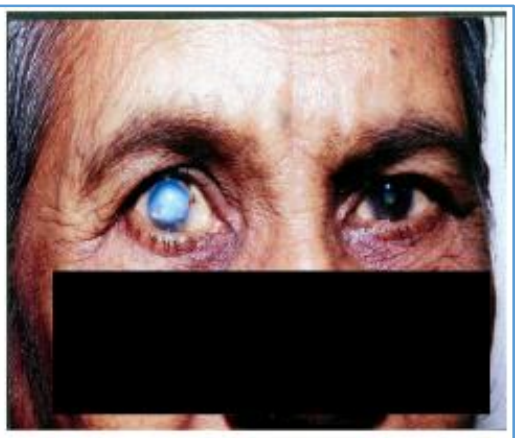


Madarosis with leucomatous corneal opacity (BE)

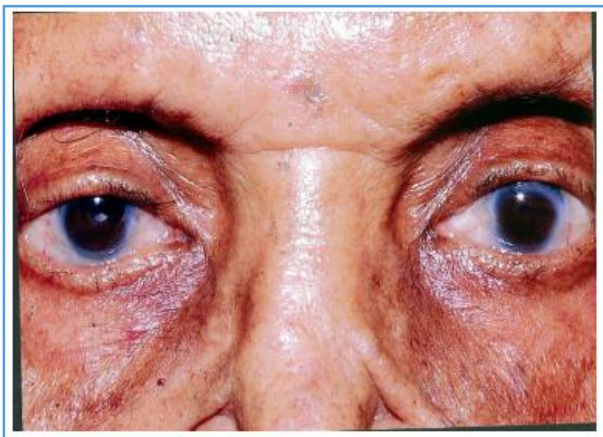
Lagophthalmos (LE)



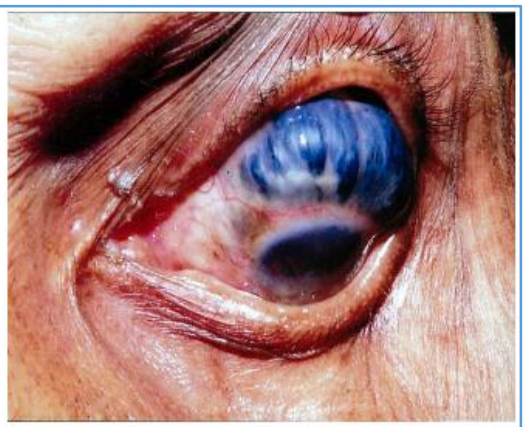
Exposure keratitis with ectropion lower lid(LE)



Total leucoma cornea (RE)



Oclusio Pupillae (LE)



Ciliary staphyloma(LE)