

Ocular Complications of Leprosy in Yemen

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مضاعفات العين عند المصابين بالجذام في اليمن

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الملخص: الهدف: تحديد المضاعفات الرئيسية التي تهدد العين والبصر والناجمة عن مرض الجذام في اليمن. الطريقة: أجريت هذه الدراسة المقطعية خلال الفترة من فبراير 2010 حتى يوليو 2010 وشملت المرضى الذين تردوا على مستشفى الأمراض الجلدية والتناسلية في مدينة النور بمدينة تعز (اليمن) من قبل أخصائي عيون وذلك بعد أخذ موافقتهم. تم أخذ التفاصيل الديموغرافية والطبية لكل مريض مع فحص دقيق للعين شاملا فحص حدّة البصر، وفحص المصباح الشقي، وفحص قاع العين على كل مريض من قبل طبيب عيون مؤهل. النتائج: شملت الدراسة 192 مريضا (180 رجلا و 12 امرأة) بنسبة تقدر 1:15 للرجال إلى النساء. كان عمر معظم المرضى (157 - 81.8%) فوق الأربعين عاما، وأكثر من ثلثي المرضى (129 - 67.2%) كانوا يعانون من مرض الجذام لأكثر من 20 عاما. وجدنا مضاعفات العيون في (97%) من الحالات، وفي (150 - 39.1%) من العيون إصابة بمرض واحد على الأقل. كانت إصابة الجفون بمرض الجذام الأكثر شيوعا (102 - 26.5%). وكانت قوة الإبصار أقل من 6/60 في (192 - 50%)، كما كانت عتامة القرنية من أكثر الأسباب المؤدية للعمى (69 - 35.9%). الخلاصة: مضاعفات العيون الناتجة عن مرض الجذام منتشرة في اليمن، وهي تهدد بفقدان البصر. من الضروري منع حدوث هذه المضاعفات بواسطة التشخيص المبكر والعلاج المناسب.

مفتاح الكلمات: جذام، عمى، عتامة القرنية، جفون العين، اليمن.

ABSTRACT: Objectives: This study was conducted to identify the main ocular- and vision-threatening complications of leprosy in Yemen. **Methods:** This is a cross-sectional observational study which took place from February to July 2010. Leprosy patients attending the Skin and Venereal Diseases Hospital in the City of Light in Taiz, Yemen, who consented to participate in the study, were enrolled. Detailed demographic and medical histories were taken and clinical examination findings were recorded. A detailed eye examination, including visual acuity (VA), slit-lamp, and fundus examinations, was conducted on each patient by a qualified ophthalmologist. **Results:** A total of 192 patients (180 male, 12 female, with a male to female ratio of 15:1) were included in the study. The majority of the patients (157; 81.8%) were over 40 years. Over two-thirds of the patients (129; 67.2%) had had leprosy for more than 20 years. Ocular complications were found in 97% of cases; 150 (39.1%) of the patients' eyes had at least one pathology. Eyelid involvement was the most common problem observed in 102 (26.5%) patients. Half of the eyes (192; 50%) had a VA of <6/60. The main cause of blindness among these patients was corneal opacity detected in 69 out of 192 patients (35.9%). **Conclusion:** Ocular complications are frequent among leprosy patients in Yemen. They are true vision-threatening lesions. It is important to prevent these lesions through early diagnosis and adequate treatment.

Keywords: Leprosy; Blindness; Corneal opacity; Eyelid; Yemen.

ADVANCES IN KNOWLEDGE

- This is the first study of its kind in Yemen that reports ocular complications among leprosy patients.
- Ocular complications of leprosy are a social and economic burden but these debilitating diseases are largely preventable in those with leprosy.

APPLICATION TO PATIENT CARE

- This study highlights the importance of regular ophthalmic exams and of providing appropriate and early treatment for leprosy patients in order to prevent avoidable blindness.
- Medical and paramedical personnel should be aware of leprosy and its ocular complications.
- The study emphasises the importance of promoting and improving ophthalmic services to leprosy patients.

LEPROSY IS A CHRONIC INFECTIOUS disease caused by *Mycobacterium leprae*, or Hansen's bacillus. This disease, which is as old as humanity, is always terrifying because it mutilates, disfigures, and causes blindness.¹ It may affect the eye through infection of the skin of the lids, tear ducts, or the lacrimal glands; it may also involve the facial and ophthalmic division of the trigeminal nerve, or direct invasion of the anterior segment, or sensitisation of the tissue to *M. leprae*.²⁻⁶

Known as *gutham* in Arabic, the history of leprosy in Yemen dates back to AD 747 when the then ruler, the Abbasid Wali, M.Z. Abou-Al-Madan, collected huge quantities of wood to burn the leprosy patients in Sana'a as a way of eradicating this problem; however, he died before he could carry out this act.⁷ These well-documented events in Yemen's history clearly demonstrate the social stigma attached to leprosy. Over-crowding, unhygienic living conditions, and malnutrition are considered principal causes of the endemicity of leprosy.

Before 1964, leprosy patients in most parts of Yemen were subjected to obligatory isolation in unsanitary houses.⁸ Clinics in Aden, Sana'a, Taiz, and Mukalla were the only places providing very basic medical care for lepers. From 1974, leprosy work in Yemen was carried out by the Missionaries of Charity. In 1982, Dr. Al-Qubati took up the duties at the Skin and Venereal Disease Hospital in the City of Light, Taiz, which was the only referral hospital in the country for the treatment of leprosy and its complications at that time.⁹ In 1991, the Missionaries of Charity left the service of the leper colonies and the National Leprosy Control Program (NLCP) and under the jurisdiction of the Ministry of Public Health took over that responsibility. The NLCP currently provides services to 80% of the country.⁹

In Yemen, leprosy patients are isolated, excluded, and even abandoned by families and society. Yemen's leprosy caseload has declined from a peak of 2,314 patients registered for multidrug therapy (MDT) in 1989 to 765 patients registered in 1996. Moreover, the registered prevalence of leprosy sufferers had declined from 1.9 per 10,000 in 1989 to 0.5 per 10,000 in 1996.¹⁰

Although leprosy control has been a public health success over the past decades, leprosy

patients still suffer from avoidable blindness. Worldwide, an estimated 200,000–300,000 leprosy patients are blind.¹¹ Many of them could have been spared this dreaded outcome by early detection and treatment of eye involvement through patient and physician education and awareness.

Blindness for leprosy patients is disastrous as they depend on their vision to protect their limbs from the injuries and burns that are due to the numbness and loss of sensation caused by the disease. This visual disability is to a large extent preventable, provided that the ocular involvement is diagnosed at an early stage and appropriate measures are undertaken in time. Globally, many studies have been carried out on the ocular complications of leprosy;^{12,13} however, in Yemen these complications have never been documented or reported. Therefore, this study was conducted to determine the main ocular findings, the presence of vision-threatening eye conditions, and the causes of visual impairments and blindness among leprosy patients in Yemen. This information will allow the establishment of a plan for eye care services through leprosy control and blindness prevention programmes.

Methods

This was a cross-sectional observational study, which was conducted from February to July 2010. Approval of the Research and Ethics Committee of the University of Aden, Faculty of Medicine & Health Sciences, was granted retrospectively in January 2011. A total of 192 leprosy patients (irrespective of the type of leprosy), who attended the Skin and Venereal Diseases Hospital located at the City of Light in Taiz, were examined. After explaining the purpose of the study, verbal consent was obtained. Some of the patients were still on MDT while others had already been released from treatment. Individuals' data on age, sex, and duration of the disease were recorded, and a short history taken regarding eye complications. Patients were first observed for any obvious facial or ocular deformities and visual acuity (VA) was assessed using a Snellen or tumbling E chart at 6 metres. An eye was considered to be severely disabled or blind when VA was <6/60. A torch light examination was done to determine eyelid position, and pupil size, shape, and reaction. The patients were then

Table 1: Ocular findings in leprosy patients

Findings	No. of eyes		Total (n = 384) No (%)	χ^2 P value
	Right (n = 192)	Left (n = 192)		
Lid involvement	54	48	102 (26.5)	0.48 0.488
Lagophthalmos	60	30	90 (23.0)	13.06 0.001
Corneal opacity	42	42	84 (21.9)	0.00 1.00
Uveitis	30	48	78 (20.0)	5.21 0.02
Cataract	24	30	54 (14.0)	0.78 0.378
Retinal lesions	0	12	12 (3.0)	0.001
<i>Phthisis bulbi</i>	0	6	6 (1.6)	0.03
VA <6/60	90	102	102 (50%)	1.50 0.2206

FEP = Fisher exact probability; * = statistically significant; VA = visual acuity

subjected to slit lamp biomicroscopy. Thereafter, the pupils were dilated using tropicamide 1% eye drops, and a fundus examination was done by a qualified ophthalmologist using a direct ophthalmoscope. Intraocular pressure was recorded using a Schiottz tonometer and corneal sensation was checked with a tuft of cotton. A visual field test was not done.

Data were analysed using Statistical Package for the Social Sciences (SPSS), Version 17, (IBM, Chicago, Illinois, USA). Descriptive statistics was done with a frequency distribution and a 95% confidence interval (CI). The chi-square and Fischer exact probability tests were used to test the association between ocular findings and the affected eye with a *P* value of <0.05 considered the cut-off point for statistical significance.

Results

A total of 192 leprosy patients were enrolled in this study, 180 (93.8%) males and 12 (6.2%) female patients, with a male to female ratio of 15:1. The age range was 22–77 years (mean + standard deviation (SD) = 55.4 ± 12.5 years). The majority of patients (157; 81.8%) were over 40 years old. The mean duration of the disease varied from 1–50 years (SD = 22.1 ± 10.3 years). More than two-thirds (129; 67.2%) had had the disease for more than 20 years, the duration being derived from patients'

statements.

Out of 384 eyes examined, 150 (39.1%) had at least one pathology, with many eyes (57.6%) exhibiting more than one lesion. Table 1 shows the major ocular lesions detected in these 192 patients as follows: eyelid involvement (trichiasis, entropion, madarosis) (26.5%); lagophthalmos (23%); corneal opacity (21.9%); uveitis (20%), and cataracts (14%). A total of 50% (192 eyes) were determined to have a VA of <6/60. Four lesions were encountered, with a higher frequency in the left eye as compared to the right. However, a statistically significant difference was detected for uveitis (*P* = 0.02); retinal lesions (Fisher exact probability [FEP]) = 0.0002), and *phthisis bulbi* (FEP = 0.03). The right eye was affected with lid lesions and lagophthalmos more commonly than the left. The difference was statistically significant for lagophthalmos (*P* = 0.0005). Age, duration of disease, and ocular findings in leprotic patients are shown in Table 2. A higher percentage of ocular findings were found in patients of >40 years (69.5%), and in those having had leprosy for >20 years (55.5%).

Patients with a VA of <6/60 underwent a detailed examination to evaluate the cause of blindness. Table 3 shows the prevalence of blindness in different leprotic lesions. Sixty-nine eyes (35.9%) were blind due to corneal opacity, whereas 60 eyes (31.3%) had cataracts, and 45 (23.4%) were blind

Table 2: Distribution of ocular findings in leprosy patients according to age and duration of disease

Findings N = 384 eyes, (192 patients)	Age in years		Duration in years		
	20-40 n (%)	>40 n (%)	<10 n (%)	10-20 n (%)	>20 n (%)
Lid involvement	30 (7.8)	72 (18.7)	15 (3.9)	36 (9.3)	51 (13.3)
Lagophthalmos	39 (10)	51 (13.2)	12 (3)	33 (8.5)	45 (11.7)
Corneal opacity	30 (7.8)	54 (14.1)	12 (3)	33 (8.5)	45 (11.7)
Uveitis	45 (11.7)	33 (8.6)	15 (3.9)	33 (8.6)	30 (7.8)
Cataract	12 (3)	42 (11)	9 (2.3)	15 (3.9)	30 (7.8)
Retinal lesions	3 (0.8)	9 (2.3)	0	6 (1.6)	6 (1.6)
Phthisis bulbi	0	6 (1.6)	0	3 (0.8)	3 (0.8)
Total	159 (41.1)	267 (69.5)	57 (14.8)	156 (40.6)	213 (55.5)
Without lesions	12 (3)	0	9 (2.3)	3 (0.8)	0
VA <6/60	6 (1.6)	186 (48.4)	30 (7.8)	24 (6.3)	138 (36)

VA = visual acuity.

because of uveitis. Thirty-seven (19%) patients had binocular blindness. Table 4 gives a summary of the ocular pathologies and main causes of blindness in different studies of leprosy.

Discussion

This study, the first of its kind in Yemen, identified the main ocular- and vision-threatening complications of leprosy. Ocular complications were found in 97% of cases studied. Over one-third of the patients' eyes had at least one pathology. Eyelid involvement was the most common problem observed. Half of the eyes had a VA of <6/60. The main cause of blindness among these patients was corneal opacity detected in more than a third of patients.

Most of the world's leprosy sufferers live in developing countries where the prevalence of many other diseases is high and medical care is very limited. Generally, patients suffer from stigmatisation, which is an experience common to leprosy patients in all societies, and this limits their use of the scarce medical services that are available. Unfortunately, the resulting delays in treatment worsen long-term outcomes.

Many studies that have dealt with leprosy either in Yemen or in its neighbouring Gulf Cooperation Council (GCC) countries have been epidemiological and therefore, have not reported the ocular complications and sequelae of the

disease which are challenging for patients.¹⁴⁻¹⁷ In this study, out of 384 eyes, 97% of the patients had ocular complications, which is comparable to results in Iran (98.53%)¹⁸ and India (87%),¹⁹ but a much higher than that reported in Nepal (57%),^{20,21} Brazil (31.5%),²² or South Korea (34%).²³ This could be explained by the fact that a higher proportion of Yemeni patients usually present late for treatment and have more limited access to medical care.

In the present study, the majority of patients were males (93.8%), a similar percentage to that noted in other studies.^{20,24,25} However, the male to female ratio in this study was 15:1, which is considerably higher than that of a study in Nepal²¹ that reported a ratio of 3:1 and a study by Holmes that reported a ratio of 2:1.²⁶ In addition to the stigma presented by the disease itself, this ratio can be explained by the cultural habits and socioeconomics of Yemeni people as Yemeni women make use of health services less frequently than men.

The mean age of the patients in this study was 55.4 years which was significantly higher than the 35.2 years reported in a study done by Wade *et al.*²⁷ In the present study, a higher proportion of the patients (81.8%) were over 40 years of age, which is similar to the earlier observations from Nepal,²¹ South Korea,²⁴ and south Vietnam.²⁵

Gupta *et al.* reported that ocular lesions were seen more frequently with increasing patient age and disease duration.²⁸ Similar results were documented

Table 3: Prevalence of blindness in different ocular leprotic lesions (n = 192 eyes)

Causes	n (%)	95% Confidence interval
Corneal opacity	69. (35.9)	29.3–43.2
Cataract	60 (61.3)	24.9–38.4
Uveitis	45 (23.4)	17.8–30.2
Retinal lesions	12 (6.3)	3.0–10.9
<i>Phthisis bulbi</i>	6 (3.1)	1.2–7.0

in this study where ocular involvement increased with disease duration and patient age. Only 14.8% of patients who had had leprosy for <10 years had ocular involvement as opposed to 55.5% who had had the disease for >20 years. Similar findings were reported in Nepal²⁰ and Nigeria.²⁹

Eyelid involvement was the most frequent ocular complication observed in this study (26.5%). However, the possibility of trachoma as a contributing factor cannot be excluded, although leprosy itself can cause lid affection. Lagophthalmos and corneal opacity were other common ocular complications, representing 23 and 21.9% of cases, respectively. This finding was similar to a study done in Nepal where 45% of patients experienced either lagophthalmos or corneal opacity.²¹ This finding is not surprising as leprosy is a granulomatous disease primarily affecting the peripheral nerves. Uveitis (20%) and cataracts (14%) were the next two most common ocular complications observed in this

study. Cataract was seen with higher frequency among patients >40 years (11%) as compared to 3% in patients of <40 years. This could simply be age-related; however, some cataracts may have been due to long-term steroid use in severe or recurrent leprosy immune reactions, or due to chronic uveitis. At the level of the posterior segment we noticed only 12 cases (3%). Most of them were not related to the disease but showed age-related macular degeneration, comparable to the observation by Chams *et al.*, who reported macular degeneration in 5.2% of patients.¹⁸

Lid lesions and lagophthalmos were observed with a higher frequency in the right as opposed to the left eye, which was statistically significant. Moreover, there was a significantly higher percentage of uveitis observed in the left eye compared to the right one. However, retinal lesions and *phthisis bulbi* were only documented in patients' left eyes. The significant difference in the rate of occurrence of ocular complications between right and left eyes remains a mystery.

Among Yemeni patients with ocular complications, 50% of eyes were blind which is comparable to results in Nepal (48%), and in Cameroon (38.3%); however, these rates are much higher than those reported by Vedy *et al.*¹ (2–5%), Sansarricq (5.4%)³¹ and Nepal *et al.*²¹ These differences could be due to lack of uniformity in the definition of blindness, with blindness being defined as VA ranging from <0.1, to <6/60, or <6/120 with

Table 4: Prevalence of ocular pathologies (OC) and main cause of blindness in different studies of leprosy

Author/year	Country	Sample Size	Prevalence of OC in %	Prevalence and main cause of blindness in %	Ocular Complications
Lamba, 1984 ¹⁵	India	650	87.3	CO = 33.6 Lago = 45	Lago, CO, Cat, Uveitis
Lewallen, 2000 ¹⁹	Korea	270	34	Cat = 46 CO = 87	Cat, CO, Uveitis, Lago
Mvogo, 2001 ²⁶	Cameroon	218	77.5	Cat = 38.3 Lago = 33.2	CO, Lago, Lid lesions, Iritis
Nepal, 2004 ¹⁷	Nepal	58	57	CS = 48 CO = % unreported	CS, CO, Lago, Uveitis, Cat.
Mpyet, 2005 ²⁵	Nigeria	480	47	Cat = 31.9 Lago = 46	Cat, Lago, CO, Uveitis
Present study	Yemen	192	97	CO = 50 Lago = 35.9	Lid lesion, Lago, CO, Uveitis, Cat

CO = corneal opacity; Lago = lagophthalmos; Cat = cataract; CS = corneal sensitivity

best correction in the better eye.^{12–30} Out of these blind eyes, 37 patients (19%) were completely disabled due to binocular blindness.

Corneal opacity was the commonest cause of blindness in this study (69 out of 192 patients; 35.9%) which is logical as lagophthalmos and lid involvement were the most frequent complications; they may lead to exposure keratitis, corneal ulceration or corneal anaesthesia. Corneal opacity was the second commonest cause of blindness among leprosy patients in a study done in Nigeria (28%), which also confirms that in leprosy the cornea is a target organ either indirectly or directly through the spread of bacilli by an exogenous, haematogenous, or neurogenous route.^{1,29} Cataracts ranked as the second most common cause of blindness (31.3%) in this study, while it was the most common cause in Nigeria (46%) and South Korea (87%).^{23–32} In Nepal, uveitis with secondary glaucoma was a primary cause of blindness in the past but with increased knowledge of the disease and its complications, and the introduction of new treatments, these causes have declined dramatically.²⁰ In contrast, in the current study, uveitis was found to be the third most common blinding condition (23.4%). This could be explained by the fact that most of the patients with chronic cases of uveitis had extremely constricted pupils, and treatment to dilate them was unsatisfactory due to the atrophy of the iris dilator muscles and synechia.

Conclusion

Ocular complications from leprosy are frequent in Yemen regardless of the form of leprosy, with lid involvement being the most frequent complication. Of the 384 eyes examined, 50% were blind due to leprosy. Corneal opacity, cataracts, and uveitis were the most common causes of this blindness. Since ocular involvement occurs late in the course of the disease, blinding lesions could be prevented by early diagnosis, and prompt and adequate treatment. Therefore, all health and paramedical personnel in charge of leprosy patients must be trained in the basics of the disease and its ocular complications. Additionally, a policy should be enacted whereby health care providers ensure patient follow-up during and after MDT, with periodic ophthalmic examinations in leprosia. Further research should be done to relate the ocular complications to the

type and reactions of leprosy, and to ascertain whether released patients are still undergoing MDT.

There is an urgent need for better collaboration between leprosy control and blindness prevention programmes, and their integration into general health services to enable patient access to high quality eye care services and to allay unjustified fears of leprosy.

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