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Original Article

Variation of intraocular pressure in patients with leprosy

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Abstract
Introduction: There are various controversial reports on intraocular pressure (IOP) in patients with leprosy. Purpose: The current study was undertaken to study the level of intraocular pressure in leprosy patients and its association with the risk factors. **Materials and methods:** This was a prospective cross sectional comparative study. An ophthalmologist and a dermatologist evaluated consecutive 93 patients with leprosy. The risk factors studied were age, gender, bacillary index, clinical diagnosis, duration of disease and treatment; and ocular complications. The IOP in these patients was compared with healthy age and sex matched controls. **Results:** A total of 186 leprosy patients (93) and healthy controls (93) were studied. The mean applanation IOP for the right and left eyes in leprosy patients was 12.87 ± 1.20 mm of Hg and 13.22±2.70 mm of Hg respectively. This was found to be significantly lesser ($p<0.001$) than in the controls (RE=15.14±2.58 and LE=15.41±2.36mmHg). The untreated leprosy patients had significantly lower IOP than those with treatment ($p<0.001$). None of the risk factors were found to be independently associated with the decrease in IOP. The duration of treatment, however, showed a trend towards having a significant association ($p=0.057$) with the lower level of IOP. **Conclusion:** The level of IOP is lower in leprosy patients than in the healthy controls. Age, gender, bacillary index and presence of ocular complications due to leprosy are not independently associated with the decrease in IOP. The untreated leprosy patient tends to have a lower IOP. This finding can be used to monitor effectiveness of treatment of leprosy.

Key words: Leprosy and intraocular pressure

Much interest has been generated by the variable reports on intraocular pressure (IOP) in patients with leprosy[1-5]. Previous reports on leprosy patients residing in endemic region or region with poor multi drug therapy (MDT) coverage have revealed lower IOP[1,2].

The explanations given for this are chronic plastic iridocyclitis, poorly treated iridocyclitis, lepra reactions and involvement of the autonomic nervous system by the bacilli[1-5]. Few investigators have demonstrated raised IOP in these eyes [2,6,7]. Recent reports, however, have revealed normal IOP in these patients [8].

Still other studies have reported the low IOP as an early or subclinical indicator of leprosy[9].

This work was carried out to study the level of IOP in leprosy patients and its association with the risk factors.

Materials and methods

We evaluated 93 consecutive patients with leprosy between July 2003 and June 2004 presenting to the B P Koirala Institute of Health Sciences (BPKIHS), Nepal were subjected to dermatological evaluation, which involved detailed history pertaining to duration of symptoms, duration of treatment and lepra reactions. In all of the patients, bacillary indices (BI) were determined by skin slit smear examination (from 6 predetermined sites, namely one from each ear lobe and medial part of brow and from the skin lesions).

Ocular evaluation consisted of detailed history of any decrease in vision in the past or ocular redness with or without pain. Ocular examination included determination of best-corrected visual acuity, slit lamp examination, corneal sensation and gonioscopy.

IOP was determined using Goldmann applanation tonometer and an average of three readings was recorded for each eye. Because the normal range of IOP is generally defined 10 to 21, we defined decreased IOP as IOP less than10mm Hg[10].

Active uveitis was defined as presence of cells (in 3 X 2 mm-slit area) in the anterior chamber, whereas resolved uveitis was defined as presence of old keratic precipitates without presence of cells.

Loss of iris pattern, ectropion uveae and peripheral anterior synechae were recorded when they were found without evidence of active or resolved uveitis.

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Heavy pigmentation of the trabecular meshwork was defined as presence of pigments in the superior portion of trabecular meshwork without any prior history of trauma or ocular surgery.

Ninety-three healthy age and sex matched controls without prior histories of any ocular disease were taken from the general out patients department of our institute. IOP in controls was determined using the same instrument and method as used for the patients with leprosy.

Student t test was used to compare the IOP between the two groups and p value of <0.05 was considered as significant. Logistic regression analysis with backward elimination was used to find out the independent association between IOP of less than 10mm Hg and the risk factors.

Results

The demographic features of the patients are elaborated in the table 1. Among these patients 16 (17.2%) were of LL type, 9 (9.68%) were of BL type, 46 (49.46%) were of BT type, 13 (13.98%) were of TT type and 8(8.6%) were of pure neuritic type. One of the patients was classified as indeterminate type. Mean duration of disease (based on history) was found to be 2.77 ± 4.92 years (95%CI =2.05-3.49 years). Mean duration of treatment was 0.62 ±1.07 years (95%CI=0.46-0.77). Forty-seven patients had some form of leprosy related ocular complications (table 2).

Table 1: Demography of the subjects

	CASES	**CONTROLS**
Number of patients	93	93
Number of eyes	182 (4 eyes excluded)	186
AGE (years)		
Mean age ±SD	36.99±15.23	38.56±16.3
95% CI	34.76-39.22	35.20-41.92
SEX		
Males	67(72.04%)	65(69.89%)
Females	26 (27.96%)	28(30.11%)

Table 2: Relation of Ocular Complications and intraocular pressure

UVEITIS RELATED			**OTHERS**		
	<11 mm Hg	**>11mm Hg**		**<11 mm Hg**	**>11mm Hg**
Active uveitis	3	3			
Resolved uveitis	3	1			
Loss of iris pattern	0	4	Prominent corneal nerves	2	13
Heavily pigmented trabecular meshwork	1	1	Intersitial keratitis	0	4
Posterior synechae	0	1	Madarosis	2	1
PAS	1	2	Dacryoadenitis	0	1
Ectropion uveae	1	2	Nodular scleritis	0	1
Total	9	14	Total	4	20
Chi square test p value =0.163					

Applanation IOP was measured in all patients (182 eyes), except 4 eyes were it was not possible due to the existing leprosy related corneal pathology. The mean applanation IOP for the right and left eye in patients with leprosy was 12.87 ± 1.20 mm of Hg and 13.22±2.70 mm of Hg respectively. This was found to be significantly lesser than the controls (p<0.001). (Table 3) None of the patients had hypotony (IOP <5mm Hg) and one patient had the IOP of 26 mm Hg.

Table 3: Distribution of intraocular pressure in cases and controls

	Cases		**Controls**	
	RE	**LE**	**RE**	**LE**
Mean± SD	12.87± 1.20	13.22±2.70	15.14±2.58	15.41±2.36
95% CI	12.34-13.39	12.66-13.79	14.61-15.67	14.92-15.89
Range	6-20	8-26	8-20	8-20
P value	P<0.001	P<0.001		

Table 4: Risk factor analysis for IOP <10 mm Hg.

	P value	**Odds Ratio**
BI	0.19	0.87 (0.70-1.07)
Disease duration	0.36	0.95(0.84-1.06)
Treatment duration	0.06(0.057)	1.68 (0.99-2.88)

Table 5: Relation of IOP with treatment status

Duration of treatment	**No of Eyes**	**Mean±SD**	**95% CI**
No treatment	71	10.62±1.47	10.00-11.25
<1 year	87	10.16±1.13	9.69-10.64
> 1 year	24	12.75±3.39	11.32-14.18

Table 6: Relation of IOP and disease duration

Duration of disease (in years)	**Right Eye (mm Hg ± SD)**	**Left Eye (mm Hg ± SD)**
≤1	13.457±2.401	13.340±2.846
>1-2	13.063±3.991	13.000 ±2.882
>2-3	11.909 ±1.814	11.909 ±1.921
>3-5	13.222 ±1.986	14.222±2.906
>5	11.625 ±4.138	12.375 ±2.722

Table 7: Relation of Bacillary Index and intraocular pressure

Bacillary Index	**Number of patients**	**Mean IOP (in mm of Hg)**	
		RE	**LE**
0	**53(56.99%)**	12.963±2.223	12.868±2.788
1	**14(15.05%)**	13.083±3.232	14.083±2.712
2	**4(4.3%)**	11.000±2.582	10.500±3.000
3	**2(2.15%)**	13.000±4.243	13.000±1.414
4	**7(7.53%)**	13.571±3.823	14.714±3.147
5	**5(5.38%)**	14.800±6.380	12.200±2.683
6	**8 (8.6%)**	13.000±2.236	14.571±1.512
Paucibacillary		12.59±2.21	12.79±2.86
Multibacillary		12.81±2.93	13.94±3.36
P value (pauci and Multibacillary)		(P = 0.809)	(P = 0.121)

To find out the independent risk factors for decreased IOP in these patients, we identified age, sex, bacillary index; presence of ocular complications due to leprosy, duration of leprosy, duration of treatment and type of clinical diagnosis. Out of these only age (p=0.13), bacillary index (p=0.08), presence of complications due to leprosy (p=0.13), disease duration (p=0.14) and duration of treatment (p=0.07) qualified for entrance in the logistic regression model. None of these factors were found to be independently associated with increased risk of decrease in IOP (IOP< 10mm Hg). Only the duration of treatment showed a trend (p=0.057) towards having a borderline significance (table 4).

The patients with no treatment for leprosy or having treatment for less than 1 year were having lesser IOP than those having treatment for a more prolonged duration (table 5). Relation of IOP with duration of disease and bacillary indices are shown in table 6 and 7 respectively.

Discussion

The eyes in leprosy have been described as the most frequently involved organ particularly in the pre multi drug therapy (MDT) era literature [1-3,11,12]. With the advent of MDT the incidence of ocular involvement has probably decreased[13].

Since uveal tissue has the highest blood flow rate than any other organ in the body, chances of harboring any organism in this tissue are high. Ciliary body, which is relatively cooler because of its anterior location in the uveal tract, is a preferred site for the M leprae bacilli.

Direct damage to the cilliary body or indirect damage to its autonomic supply is the mechanism proposed for the decrease in aqueous production in patients who are inadequately treated or have high bacillary indices. [2,4]Chronic plastic iridocylitis or acute uveitis produced as a complication can also decrease the IOP[2,3]

Hussein et al had found low IOP in patients with leprosy as well as their house hold contacts, which they proposed as the early indicator for the ocular involvement[9]. Other studies in the recent years have found that prolonged duration of disease, treatment status as well as high bacterial load are not related to decrease in IOP particularly in eyes without anterior uveitis in MDT era[8].

In this study we found significantly lower IOP in patients with leprosy when we compared with age and sex matched controls. While studying the risk factors determining the decrease in IOP in these eyes no significant independent risk factor was found.

Bacillary index and clinical diagnosis didn't correlate well with the IOP in these eyes.

Higher bacillary index or uninhibited growth of these bacilli had been suggested to increase bacterial load in the ciliary body producing decrease in IOP without apparent ocular pathology.

Since leprosy is a chronic disease, most of the patients present insidiously. Also presentation of the patients depends on the nature and severity of the clinical symptoms. These factors are compounded by the poor socioeconomic status of these patients. This may be a reason why duration of the disease generally does not correlate well with the actual duration of the disease.

In our series the duration of disease varied from 3 months to 40 years. Though there were fewer patients with longer duration of disease, it was not found to be an independent risk factor for decrease in IOP.

It is interesting to note that chronic inflammatory infiltrate in the cilliary body had been demonstrated histopathologically in patients with paucibacillary disease[14]. A report from Uganda noted higher prevalence of chronic uveitis in patients having paucibacilary disease (TT; 1% and BT; 5.6%) than those with multibacillary disease, which they accounted for the longer duration of inadequately treated disease[15].

Ocular complications particularly uveitis and its related complications as well as other leprosy related ocular complications found in our study did not produce significant drop in IOP as compared to eyes without complications (Table 2).

Only the risk factor having a borderline significance was duration of treatment, which in our series varied from no treatment to 6 years.

Patients without treatment or on treatment for 1 year or less were found to have lesser IOP. It is possible that patients without treatment may have high bacterial load in the cilliary body producing lower IOP in these eyes. Probably high bacterial load alone as found in slit smear examination might not be enough to tell about the actual functional bacterial load. It is possible that patients on MDT having high bacterial load demonstrated on smears may actually represent deactivated or dead bacilli. This may be a reason why higher bacillary indices were not found to

be an independent risk factor for a drop in IOP. It may also be related to the lesser representation from patients with longer duration of treatment in this series. A follow up cohort of these patients on MDT may help us to understand this better.

In conclusion, as highlighted by this study leprosy patient not on treatment tends to have a lower IOP. We believe that monitoring the IOP during therapy may tell us about the progress of the patients on MDT. This may also help to monitor the patients who are defaulters as well as those released from therapy.

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