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Magnitude and associated factors of ocular lesions/complications among leprosy patients treated at Boru Meda General Hospital, Ethiopia: Cross sectional study design, 2021

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Abstract

Background: *Leprosy is one of the world's oldest diseases, also known as Hansen's disease. It is one of the major blinding diseases. Visual impairment of leprosy patients needs special consideration by dermatologists and ophthalmologists, not only preventable but also has a severe burden that affects productivity if not managed early. Nevertheless, little was understood about ocular complications and associated factors among leprosy patients in low–income countries like Ethiopia including the study locality.*

Methods: *An Institution based cross-sectional study was used among a total of 423 leprosy patients at dermatology clinic at Boru Meda hospital. Then the collected data entered using entered EpiData v3.1 and exported to statistical package for Social Sciences (SPSS) v20 for statistical analysis. The odds ratio along with a 95% confidence interval was estimated to measure the strength of association between dependent and independent variables. P≤0.05 was used to determine the level of statistical significance.*

Result: *A total of 419 leprosy patients were participated in this study, which accounts a response rate of 99%. The proportion of ocular complication was found to be 69.9%, (95% CI:(65.09-73.9)). Age 40years and above{(AOR=5.2,95% CI:(3.14-8.83)}, presence of leprosy reaction {(AOR=1.92,95%CI:(1.12-3.24)}, and leprosy disability grading (grade1 disability{(AOR=2.9,95%CI:(1.35-6.33)},grade 2 disability{(AOR=3.0,95% CI:(1.36-7.08)} were associated with the presence of ocular complication among leprosy patients.*

Conclusion: *Our finding showed that, the magnitude of ocular complication/lesion was high. Age 40 and above, presence of leprea reaction, and disability were significant factors associated with developing ocular complications among leprosy patients. This emphasizes the need for a strong collaboration efforts and commitment to handle ophthalmologic complication among leprosy patients with the age 40 and above, having leprosy reaction and disability.*

Keywords: Magnitude, associated factors, Leprosy, Ocular complication/lesions

Introduction

Leprosy is one of the world's most established illnesses, otherwise called Hansen's infection. It is a persistent infection brought about by a corrosive quick, bar molded bacillus called mycobacterium leprae. The bacillus influences the skin and Schwann cells of the fringe nerves, bringing about cutaneous injuries and neuropathy. Loss of tangible, engine, and autonomic nerve work in the eyes, hands, and feet can bring about optional difficulties, like disfigurement, impedance, mental aggravations, and social rejection [1, 2]. The mycobacteria enter the human body through the nose and spread to the bodily fluid film, skin, and nerves [3]. People of any age and the two genders are impacted by this infection [4].

It has two structures the first is multi-bacillary where in excess of five skin sores are observed which incorporate polar lepromatous

(LL) borderline lepromatous (BL) and borderline (BB). Also the subsequent kind is pauci-bacillary where up to five skin injuries are found in disease patients which incorporates just smear-negative uncertain (I), borderline tuberculoid (BT), and polar tuberculoid (TT) [5-7]. Sickness responses are the primary intricacy of the illness. A critical extent of uncleanliness patients, foster sickness responses an intense immunologic extreme touchiness that can happen before the analysis and during or after therapy and cause nerve injury while possibly not suitably treated. There are two essential sorts of a touchiness response: type 1 responses or inversion responses and type 2 responses, or erythema nodosum leprosum (intensification of humoral invulnerability). There is a reasonable proposal for corticosteroid treatment of serious kind 1and 2 reactional episodes. This uncleanliness response prompts pulverizing impacts on various pieces of the body [6].
The world health organization's (WHO) elimination strategy of leprosy is defined as reducing registered cases of leprosy to less than one per 10,000 people. The global prevalence of leprosy is reduced by 90% when compared with 1985. In Ethiopia, the prevalence was 0.6 per 10000 inhabitants [8]. However, the highest proportion of childhood leprosy and a considerable number of new cases could witness the active transmission of the disease and the existence of new infections within the country [4].
In Leprosy, eyes are frequently affected [9]. It is a blinding disease. It affects the eye due to its effect on the skin of eyelids, tears ducts, and lacrimal glands. It also affects facial and trigeminal nerves that supply the eye or its direct effect leads to ophthalmic complications. Visual impairment and blindness occur in patients with ocular leprosy; these individuals are from 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 [10]. Although the presence of multi-drug therapy reduced the global incidence of leprosy-related eye diseases. Most of the leprosy-related eye sufferers are those with older age groups and disabled [5,11].

Ocular complications can be divided into leprosy-related and general ocular complications. Lagophthalmos, ectropion, entropion, madarosis, trichiasis, episcleritis, scleritis, scleritis, diminished corneal sensation, corneal opacity, acute and chronic iritis can be categorized as leprosy related ocular complications. While, pterygium, cataract, and aphakia can be categorized as general ocular complications [1]. In contrast to this cataract is categorized as the leading cause of blindness [5].

Boru Meda hospital is a known hospital as both leprosy and ophthalmic center serving many patients; the extent of ophthalmic complications of leprosy is not yet reported. Therefore, this study was conducted to determine the ocular complications or lesions and to identify associated factors.

Methods

Study setting and design

This study was conducted in Boru Meda General Hospital, serve as a referral for treatment and rehabilitation center for dermatology (primarily for leprosy patients) and ophthalmology cases in the East of the Amhara region.

The research was conducted as an institutional based cross sectional study design.

Source Population

All leprosy patients who came to dermatology Out Patient Department of Boru Meda hospital within the data collection period.

Inclusion criteria

All leprosy patients who came to the dermatology OPD during the data collection period and accept consent.

Exclusion criteria

Patients who came more than once, who were critically ill and unable to communicate, and age < 18years old and came without care giver during the data collection period were excluded.

Sample Size Determination

The sample size was determined using a single population proportion formula considering the following assumptions: standard normal distribution with confidence interval (CI) of 95% (Z=1.96), absolute precision or tolerable margin of error (d=0.05).
n= 423.

Sampling procedures

Boru Meda hospital was selected purposively because it is a known leprosy center in north east Ethiopia with greater leprosy patient flow and due to the availability of ophthalmic center. Among patients who come to dermatology OPD, confirmed leprosy patients were selected consecutively based on their arrival. For those who fulfill the eligibility criteria, data collectors (dermatologists) from dermatology OPD were completed the data collection tool from part one to part two. Then, they sent the patient with his/her medical record and the data collection tool to ophthalmic OPD through porters and selected ophthalmologists to collect the data filled part three of the data collection tool. List of ID numbers of leprosy patients was recorded at Dermatology OPD to avoid redundancy/double count.

Data collection instrument and Procedure

An interviewer administered tool /questionnaire was used to collect information on the socio- demographic status. It was prepared in English and translated to Amharic. Trained supervisor were supervising the data collection process. During data collection three dermatologists from dermatology OPD and two Ophthalmologists from ophthalmic OPD were involved to collect the data. Dermatologists evaluate leprosy patients for the type of leprosy and fill part one and two of the data collection tool and those known leprosy patients were sent for ophthalmological examination of the eye including observing external part of the eye and examining of anterior part of the eye with slit lamp, tonometry and visual acuity by ophthalmologists. Similar professionals were collecting the data in each department and supervisors were reviewing data for completeness to keep the reliability of data. Data were collected by a pretested tool.

Data processing and analysis

Data were checked for culmination, coded and entered in to EpiData adaptation 3.1 and sent out to factual bundle for Statistical Package for Social Sciences (SPSS) form 20 for investigation. For all straight out factors frequencies and rates were determined. Parallel strategic relapse examination was utilized to get chances proportion and the certainty time period related factors. All factors with $p < 0.2$ in the bivariable investigation

were remembered for the last model/multivariable paired strategic relapse. Hosmer and Lemeshow was utilized for model wellness test, the greatness of relationship between various factors corresponding to the result variable was estimated by chances proportion with 95% certainty span and level of factual importance was announced at p esteem ≤0.05.

Data Quality Management

In order to keep the data quality, the (part one) questionnaires first prepared in English and then translated to Amharic and again in order to check the consistency of the Amharic questionnaire it was re-translated to English by other person who knows the local language very well. All data collectors two ophthalmologists, three dermatologists, and one supervisor (BSc cataract surgical officer) were trained for one day about the purpose of data collection, how to collect the data and confusing things on data collection tool were cleared.

Pre-test was conducted on 5% of patients at Boru Meda hospital who come to dermatology OPD prior to the actual data collection period. Then based on the result of the pretest, relevant corrections were made. During data collection period supervision was undertaken by supervisor at the data collection site how data collectors were doing their task on daily basis. At the end of each data collection day, the principal investigator was carefully checked entered and thoroughly cleaned the data before the commencements of the analysis.

Result

Socio-demographic variables

From a total of 423 leprosy patients who were recruited, 419 were participated in the study with the response rate of 99%. Among the study participants 290(69.2%) were males, ages ranged from 16 to 78 years, mean age of respondents was 46(SD±13.89) years.(Table 1):

Table 1: Socio-demographic characteristics of leprosy patients at Boru Meda hospital, Dessie city administration, south Wollo Zone, Amhara region, 2019/20. (n=419)

Characteristics/variable		Frequency	Percent
Sex	Male	290	69.2
	Female	129	30.8
Age group(years)	<40	134	32
	>=40	285	68
Residence	Urban	96	22.9
	Rural	323	77.1
Marital status	Single	91	21.7
	Married	268	64.0
	Divorced	47	11.2
	Widowed	13	3.1
Educational status	Cannot read and write	206	49.2
	Have no formal education	111	26.5
	Elementary (1-8)	93	22.2
	Secondary (9-12) and above	9	2.2
Occupation	Govt/NGO employee	25	6
	Self-employee	39	9.3
	Housewife	107	25.5
	Farmer	204	48.7
	Other	44	10

Clinical factors

Of 419 subjects, 54 (12.9%) were new, (30.3%) were having the disease for more than 20 years, the duration being derived from statement of patients. Two hundred eighty five patients (68%) were classified as having multi bacillary leprosy. One hundred sixty one patients have physical deformity. Disability grade 1was found in (17.2%) and disability grade 2 was found in (20.5%) of leprosy patients. In relation with leprosy reaction, (67.5%) of participants were having reaction of type 1 and 2 (table 2):

Table 2: Clinical characteristics of leprosy patients at Boru Meda hospital, Dessie city administration, south Wollo Zone, Amhara region, 2019/20. (n=419)

Clinical variables		Frequency	Percent
Category of disease	Pauci bacillary(PB)	134	32
	Multi bacillary (MB)	285	68
Duration of leprosy	New	54	12.9
	1year -20 years	238	56.8
	>= 20 years	127	30.3
Presence of physical deformity	No	258	61.6
	Yes	161	38.4
Disability grade	0	261	62.3
	1	72	17.2
	2	86	20.5
Presence of leprosy reaction	No	136	32.5
	Yes	283	67.5
*No patient was found as relapse or defaulter			

Visual status of each eye as examined by Snellen eye chart

Out of 838 eyes examined, 244(58.2%) and 243(57.9%) had visual impairment in the right eyes and the left eyes respectively and 16(3.8 %) of right eyes and 29 (6.9%) of left eyes were severely blind. Visual status was assessed for both right and left eyes (Table 3).

Table 3: Visual status of examined eyes of leprosy patients at Boru Meda hospital, Dessie city administration, south Wollo Zone, Amhara region, 2019/20

Visual status	Right eye		Left eye	
	Frequency	Percent	Frequency	Percent
Normal	175	41.8	176	42.0
Mild visual impairment	154	36.8	140	33.4
Moderately blind	74	17.7	74	17.7
Severely blind	16	3.8	29	6.9
Total	419	100	419	100

Ocular Complications found among leprosy patients

The major ocular complications found were as follows. Lid involvement (52.0%); cataract (33.2%) and corneal ulcer (19.8%). (Table 4:)

Table 4: Showing major ocular complications among leprosy, at Boru Meda General Hospital, Ethiopia, 2019/20.

Ocular complications		Frequency	Percent
Corneal sensation (n= 419)	Normal	356	80.2
	Diminished	83	19.8
Corneal opacity (n= 419)	Normal	323	77.1
	Corneal ulcer	72	17.2
	Keratitis	23	5.5
Lids normal (n=419)	No	201	48
	Yes	218	52
Has ectropion (n=201)	No	171	85.1
	Yes	30	14.9
Has entropon (n=201)	No	163	81.1
	Yes	38	18.9
Has lagophtalmos (n=201)	No	153	76.1
	Yes	48	23.9
Has madriasis (n=201)	No	165	82.1
	Yes	36	17.9
Has trichiasis(n=201)	No	152	75.6
	Yes	49	24.4
Lid closure (n=419)	Normal	303	72.3
	Impaired	116	27.7
Pupil reaction (n=419)	Normal	343	81.9
	Slugish	76	18.1
Iris (n=419)	Normal	368	87.8
	Atrophy	41	9.8
	Acute iritis	7	1.7
	Chronic iritis	3	0.7
Sclera (n=419)	Normal	334	79.7
	Episcleritis	29	6.9
	Scleritis	56	13.4
Lens (n=419)	Normal	240	57.3
	Cataract	139	33.2
	Other	40	9.5

Proportion of Ocular Complication

Ocular complications were counted if there were at least one complication in one eye. The proportions of ocular complications were found to be 69.9% with 95%CI (65.09, 73.9) (Figure 1).

Factors associated with Ocular Complication of Leprosy

On bivariable analysis, duration of leprosy, marital status, educational status, category of treatment, reversal reaction, age, leprosy reaction, occupation, category of leprosy and disability grading were found to be <0.2 and entered in to the final model. In the multivariable analysis, age, presence of leprosy reaction and presence of advanced disability grading were significant factors for the development of ocular complication as shown in table 5. The likelihood of developing ocular complication for leprosy patients with age greater than 40 years of age was five times more than those with age less than 40 years [{AOR=5.2,95%-CI=(3.14,8.83)}]. Leprosy patients who have had leprosy reaction were about two times more likely to develop ocular complication than those with no leprosy reaction [{AOR=1.92, 95%CI=(1.118, 3.235)}]. Leprosy patients with grade one disability were 2.9 times more likely to develop ocular complication than those with disability grade zero [{AOR=2.9,95%CI=(1.349,6.332)}] and the presence of leprosy disability grade two were 3 times more likely to develop ocular complication than those with disability grade zero [{AOR=3.0,95%CI=(1.356,7.083)}]. (Table 5):

Table 5: Factors associated with ocular complication among leprosy patients at Boru Meda Hospital, 2019/20. (n=419)

Variables associated with ocular complications		Ocular complication		COR	AOR (CI)	
		Yes	No		Lower	Upper
Age category in years	<40years	61	73	1	1	
	>=40	232	53	5.24	5.2(3.143	8.833)
Leprosy Reaction	No	79	57	1	1	
	Yes	214	69	2.24	1.92 (1.118	3.235)
Disability grading	Grade 0	156	105	1	1	
	Grade 1	61	11	3.72	2.9(1.349	6.332)
	Grade 2	76	10	5.12	3.0(1.356	7.083)

Discussion

This study revealed that the proportion of ocular complication was found to be 69.9% (CI 65.09, 73.9) among leprosy patients. Age, leprosy reaction and disability grading were significantly associated with ocular complications among leprosy patients.

The proportion of ocular complication observed in this study was 69.9%. This result is less than in Cameroun where 77.5% of leprosy patients have ocular complication, and 97% in Yemen [7,21]. In contrast, this result is much higher than a study in United Kingdom where 51.6% of leprosy patients had ocular complication and a study done in Gulbarga India where 24.4% of leprosy patients had ocular complication [1,20]. This may be due to the reason that the difference in leprosy controlling strategy of different countries, variation in socio demographic factors and difference in the study designs.

In this study, age was a strongly associated independent factor for the development of ocular complication in leprosy patients where leprosy patients with older age (≥40 years) had the likelihood of developing ocular complication five times than those with younger age (<40 years). Similar findings were documented where ocular complications increased with the patients age [20]. This may be due to the reason that increase in aging process by itself may increase the risk of ocular problems.

This study also revealed that the presence of leprosy reaction was one of the significant factors for the development of ocular complication where participants who developed leprosy reaction had around two times a chance of developing ocular complication than those without leprosy reaction. This is supported by a study in the Filipinos that leprosy reactions are one of the risk factors for the development of leprosy [2].

The other significant factor that is found for the development of ocular complication is the presence of advanced disability that is identified based on disability grading where leprosy patients with disability grading one and grading two had three times more likely to develop leprosy related ocular complication than patients with grade zero disability. This is supported by a study in the United Kingdom that the involvement of ocular complication in grade two disabilities was high [1]. This may be due to the reason that in grade two disability eyes are one of the affected organs.

This study allows patients to have clinical examination but has a limitation that it did not exclude the effect of co-morbid illness and the effect of previous treatment on the eye.

Conclusion

Based on the findings of this study, ocular complication was found in more than half of study participants.

Being the age of forty and above, presence of leprosy reaction, and leprosy disability grading one and two were significant factors associated with ocular complication in leprosy patients.

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Authors' contributions

FBB conceived the study, developed the tool, coordinated data collection, and carried out the statistical analysis and drafted the manuscript.
FTZ conceived the study, participated in the statistical analysis, and drafted the manuscript.
KAG, YAD Reviewed the drafted manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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