

# Prevalence and causes of blindness and Low Vision in Ethiopia

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## Abstract

**Background:** Ethiopia lacked accurate recent national estimates of blindness and low vision. Therefore, prevention and control programs face serious problem of lack of recognition of the problem and challenges in tracking achievements towards program goals.

**Objective:** To determine the prevalence of blindness and low vision at the national and regional levels in Ethiopia.

**Method:** A national survey was conducted on a representative population in all nine regional states and two city administrations of the country. The LogMar chart was used to determine the presenting visual acuity and ophthalmologists determined the primary cause of low vision and blindness.

**Results:** Based on the assessment of the presenting visual acuity, the national prevalence of blindness is 1.6% (1.1% for urban and 1.6% for rural populations) and that of low vision is 3.7% (2.6% for urban and 3.8% for rural populations). Blindness and Low vision are more prevalent among females. The major causes of blindness are cataract and trichomatous corneal opacity. The major causes of low vision are cataract and refractive error. Prevalence of childhood blindness is 0.1% and accounts for over .6% of the total blindness burden in Ethiopia. The national prevalence of Bitot's spots is 0.7%.

**Conclusion:** Blindness and low vision are major public health problems in Ethiopia. The large proportion of low vision (91.2%) and blindness (87.4%) are due to avoidable (either preventable or treatable) causes. Females and rural residents carry greater risk for eye problems. Adequate emphasis needs to be given to prevent blindness among children and avert millions of years of unnecessary blindness. Recognizing the severity of the magnitude of eye problems (blindness and low vision) and enhancing the government commitment to improve the situation is critical. [*Ethiop.J.Health Dev.* 2007;21;(3):204-210]

## Introduction

Low vision and blindness are recognized as one of the major public health problems worldwide, especially in developing countries where 90% of the blind live. International actions to prevent blindness and low vision occurrence have been accelerated over the last decade. According to the WHO over 37 million people are blind and 124 million people have low vision worldwide. Vision 2020: The Right to Sight is a global initiative of the World Health Organization (WHO) and the International Agency for the Prevention of Blindness (IAPB) in collaboration with international Non-Governmental organizations. It was launched in 1999 with the aim of eliminating the major causes of avoidable blindness by the year 2020 (1). About 75% of all blindness worldwide is believed to be avoidable and is mainly caused by cataract and trachoma. The initiative focuses on three main strategies: disease control, human resources and infrastructure development.

Ethiopia launched the Vision 2020 Initiative in September 2002. The long-term aim of this important initiative is to develop a sustainable comprehensive health care system to ensure the best possible vision for all people and thereby improve their quality of life. Blindness is not only incapacitating to the individual but also can adversely affect several aspects of poverty reduction strategies. Approximately 80% of blindness in Ethiopia was believed to be avoidable; i.e., preventable

or curable (2). Ethiopia is believed to have one of the world's highest rates of blindness. Nevertheless, except for a few small scale studies in various parts of the country (3-5) no systematic nationwide assessment was ever done in Ethiopia. The official blindness prevalence estimate used for planning purposes prior to this survey was 1.25%, which was derived based on the various small scale studies in the country and the national blindness survey conducted over two decades ago. However, there is uncertainty about the reliability of the estimate and as such it is not believed to be useful in monitoring progress made in preventing blindness and low vision. Thus this survey was conducted to provide estimates of the national and regional prevalence of blindness and low vision. It also aims at identifying the major causes of blindness in Ethiopia.

## Methods

The national blindness and low vision survey is a population based cross sectional study. The survey is a household survey and excludes individuals living in institutions and homeless people. Study population was selected using a multi-stage cluster sampling design that was stratified by regional states in the country and by urban-rural residency. All household members in the selected households were included in the survey. The selection of study population and data collection procedure is fully described in another paper (6).

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Visual acuity test was done for all members of the selected households. Both eyes of each person were examined by a designated ophthalmic nurse and ophthalmologist to determine visual status and identify the causes of blindness and low vision, respectively. Eye examination was done in accordance to the WHO's methods for assessment of avoidable blindness. Visual acuity was tested using the logMAR visual acuity test chart. The logMAR chart consists of five letters per line, each letter being a tumbling E optotype. This chart has been well validated in population based surveys (7). Appropriate care was taken by the survey team to avoid memorization of the chart by observing other persons undergoing the test. Visual acuity testing was performed during day light hours outdoors (ref: methods paper for details). Those who had a visual acuity of 6/18 or greater in the better-eye were regarded as having normal vision. All participants with a visual acuity of <6/18 were tested for refractive error. The presence of refractive error was confirmed when improvements in visual acuity to above 6/18 is observed with pinhole examination. More sophisticated testing for refraction was not performed due to resource constraints. Those who do not improve to above 6/18 after the pinhole test were referred to the ophthalmologist for a more detailed eye examination in order to determine the cause of blindness or low vision (6). The ophthalmologist performed eye examination for all persons with low vision and blindness to determine the cause with major emphasis on cataract, trachoma, glaucoma and refractive error. Any opacity of the lens visible with direct ophthalmoscope through an undilated pupil was classified as cataract. Glaucoma was diagnosed based on IOP measurements and cup to disc ratio; i.e., when the cup/disc ratio of > 0.9 and IOP of greater than 30 mmHg are obtained recorded. The pupil was not dilated in individuals suspected to be at risk of closed angle glaucoma. Visual loss is attributed to trachoma in the simultaneous presence of corneal opacities and entropion and/or trichiasis or history of epilation/TT surgery.

Data were analyzed to determine the national and regional (federal states) estimates using appropriate weights to adjust variations in population size in the regions. The proportion of blindness and low vision due to the main causes are determined. Distribution of blindness and low vision by gender, age and place of residence are explored. Projections based on the current population size of the country are made to estimate the number of people requiring treatment for various ocular morbidities. All prevalence figures given in this report are weighted for population size. The following definitions were used for analysis of visual status:

*Presenting visual acuity:* the visual acuity of the person as presented (without any correction by the survey team)

*Corrected Visual Acuity:* the visual acuity of the person taken with pinhole.

*Blindness:* Presenting visual acuity of <3/60 in the better eye.

*Low Vision:* Presenting visual acuity of <6/18 but  $\geq$ 3/60 in the better eye.

## Results

A total of 30,022 individuals were included in the survey in the eleven areas of the country; nine regions and 2 city administrations. Of the total 30,022 individuals 25,650 (85.4%) were available for examination by the survey team; out of the remaining 4,325 (14.4%) were absent and 47(0.2%) refused to participate in the survey. Major reasons for being absent include work (44.9%), school (14.3%), and visiting relatives (13.9%). Household respondents were asked about the visual status of the absentees. Accordingly, only 18 (0.4%) were believed to be blind and 95(2.2%) were believed to have low vision.

The age and sex distribution of the survey population reflects what is expected in a typical household survey in Ethiopia. About 30% of the population was children in the age group 1-9 year. Elderly population (>60 year of age) constitutes only 5.8% of the total survey population (Table 1).

Table 1. Age and sex distribution of the participants of the National Survey on Blindness, Low Vision and Trachoma in Ethiopia (2005-6)

Age group	Male		Female		Total	
	No	%	No	%	No	%
<1 Year	324	2.3	322	2.1	646	2.2
1-9 Years	4549	31.8	4515	28.8	9064	30.2
10-19 Years	3410	23.8	3700	23.6	7110	23.7
20-29 Years	1752	12.2	2542	16.2	4295	14.3
30-39 Years	1501	10.5	1851	11.8	3353	11.2
40-49 Years	1154	8.1	1205	7.7	2359	7.9
50-59 Years	717	5.0	733	4.7	1450	4.8
> 60 Years	900	6.3	827	5.3	1727	5.8

As shown in Table 2 majority (70.8%) of the household heads are farmers. The major religions of households were Orthodox Christian (42.3%) and Islam (35.7%). The majority (64.5%) of the household heads were illiterate. Only 9.6% had high school education or better.

As shown in Table 3 the national prevalence of low vision is 3.7% with considerable regional variations. The national prevalence of blindness is 1.6%. Table 4 shows that there is statistically significant difference between

the urban and rural prevalence of blindness ( $p$ -value < 0.03) and low vision ( $p$ -value < 0.001). The rural areas have higher prevalence of low vision and blindness. Females compared to males have higher prevalence of blindness ( $P$ -value < 0.001) and low vision ( $p$ -value < 0.001). As expected the people above the age of sixty year have the highest prevalence of both blindness and low vision. It is also important to note that the prevalence of childhood blindness is 0.1%, which accounts for over 6% of the total blindness burden nationwide.

**Table 2: Summary of household head selected characteristics. National Survey on Blindness, Low Vision and Trachoma in Ethiopia (2005-6)**

Occupation of Head of Household	Number	Percent
Farmer	4236	70.8
Daily laborer	131	2.2
Government employee	344	5.7
Merchant	349	5.8
House wife	247	4.1
Other	679	11.3
Total	5986	100
<b>Religion of Head of Household</b>		
Orthodox Christian	2536	42.3
Islam	2144	35.7
Catholic	52	0.9
Protestant	1075	17.9
Traditional religion	170	2.8
No religion	13	0.2
Other	12	0.2
Total	6002	100
<b>Educational status of Head of Household</b>		
Illiterate	3852	64.5
Can read and write	516	8.6
1-4 grade completed	427	7.1
5-8 completed	609	10.2
9-12 completed	297	5.0
college education	275	4.6
Total	5976	100

**Table 3: National and Regional Prevalence of Blindness and Low Vision based on presenting visual acuity. National Survey on Blindness, Low Vision and Trachoma in Ethiopia (2005-6)**

Region	Blindness	Low Vision
Tigray	1.5	2.9
Afar	1.2	2.7
Amhara	1.4	4.9
Oromia	1.6	3.1
Somali	5.4	9.7
Benshangul-Gumuz	0.8	0.7
SNNPR	0.7	2.0
Gambella	1.7	3.4
Harrari	2.2	2.2
Addis Ababa	1.4	2.7
Dire Dawa	1.7	3.1
<b>National (Weighted)</b>	<b>1.6</b>	<b>3.7</b>

Table 4: Weighted Prevalence of Blindness and Low Vision by area of Residency, Gender and Age. National Survey on Blindness, Low Vision and Trachoma in Ethiopia (2005-6)

	Blindness	Low vision
National	1.8	3.7
Residency		
Urban	1.1	2.6
Rural	1.6	3.6
Sex		
Male	1.2	3.1
Female	1.9	4.1
Age (Year)		
<16	0.1	0.5
16-59	0.7	2.9
60+	14.8	24.7

The three major causes of low vision include cataract (42.3%), refractive error (33.4%), and trachomatous corneal opacity (7.7%). The three major causes of blindness are Cataract (49.9%), trachomatous corneal opacity (11.5%), and refractive error (7.8%). All major causes of low vision and blindness are either preventable or treatable (Figure 1 and 2).

As shown in Table 5 the national prevalence in the under 5 years of age of reported night blindness is 0.1%, and the observed prevalence of conjunctival xerosis is 0.9%, and Bitot's spot is 0.7%.

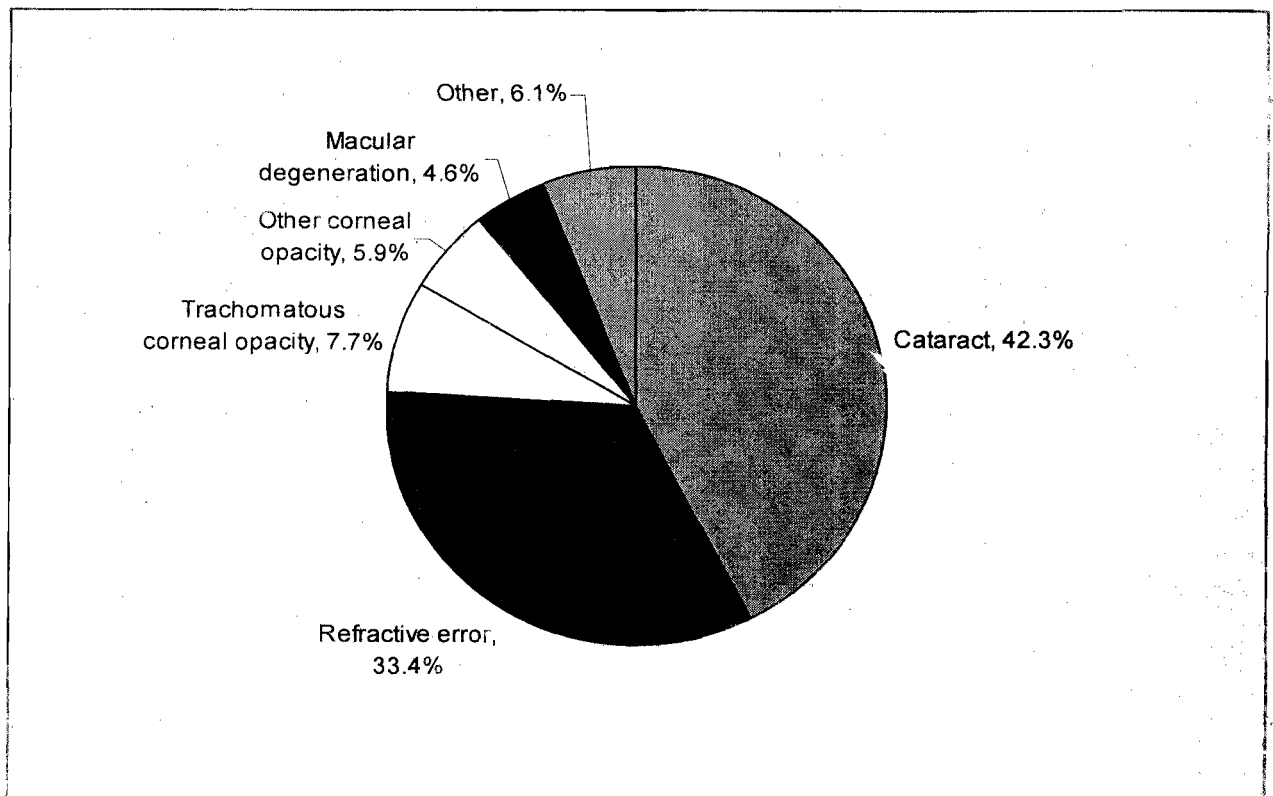


Figure 1: Causes of Low Vision. National Survey on Blindness, Low Vision and Trachoma in Ethiopia (2005-6)

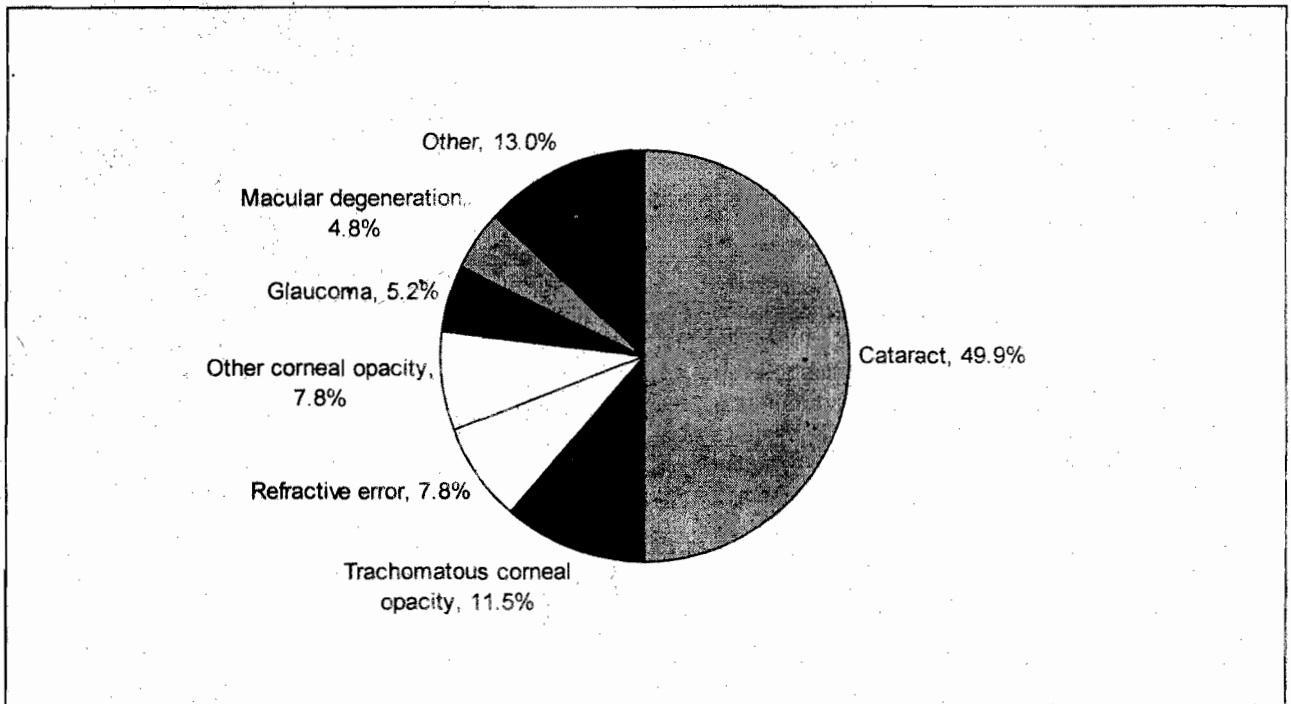


Figure 2: Causes of Blindness. National Survey on Blindness, Low Vision and Trachoma in Ethiopia (2005-6)

Table 5: Vitamin A Deficiency Eye Diseases. National Survey on Blindness, Low Vision and Trachoma in Ethiopia (2005-6). (Only for Under Five)

Vitamin A deficiency Eye Problems	Percent
Night Blindness	0.1
Conjunctival Xerosis	0.9
Bitot's spots	0.7

**Discussion**

Overall the survey indicated a very high prevalence of low vision and blindness in the country. The prevalence is greater in the rural population and among women. The major causes of low vision are cataract, and refractive errors that are by and large preventable and avoidable. The major causes of blindness are cataract and trachoma. Cataract is treatable, whereas trachoma is both preventable and treatable.

Some of the villages were extremely remote and posed a serious challenge for the strict implementation of the survey procedures. Quality control in remote regions was a serious challenge and results must be interpreted carefully. Five clusters with obvious uncertainty about data quality are excluded from analysis. In a few remote villages where settlement is scattered sampling on a straight line direction as described in the sampling procedure was practically impossible. Thus, a proximity sampling strategy was used as there was no danger of clustering of the outcome of interest in a scattered settlement.

The low prevalence of blindness and low vision in the Benshangul-Gumuz regional state was attributed to the presence of large number of healthy immigrants from the neighboring Sudan into the survey villages, as observed by the survey team. The very high prevalence of low vision and blindness in Somali region could not be adequately explained.

Estimates in this paper provide the magnitude of the eye problems at the national and regional levels. Regional estimates are self-weighted and no adjustments were made. All national estimates in this paper are weighted for population size of regions. No attempt was made to provide zonal and woreda level estimates based on this study as the sample size calculations and sampling procedures were not designed to produce estimates at those levels. This is strictly a household survey and as such no homeless people even those living in the survey clusters were included. Our assessment emphasized on determining the presenting vision of the persons; this approach helps to determine the needs for appropriate interventions.

**Very large proportion of the causes of blindness and low vision are avoidable (preventable or treatable) with time proven interventions that are both feasible and reasonably affordable in the Ethiopian context.** About 50% of the blindness (600,000 persons) and 41% of low vision (1.2 million persons) are due to cataract that can be corrected surgically. Trachoma also accounts for a significant proportion of blindness (11.5%) and low vision (7.7%). Again there are effective prevention and curative instruments for avoiding eye problems due to trachoma.

The prevalence of blindness reported in this survey is similar to the recent reports from African countries. Studies from Cameroon, Nigeria and Mali also reported a similar prevalence rate of blindness and the main cause for blindness and low vision were cataract, accounting for 60% of all bilateral blindness and 51.7% of all low vision. (8-10). Population based surveys in Ethiopia also reported cataract as the main cause of blindness (5, 11). The study from Butajira, Ethiopia, indicated that blindness is either preventable or curable in 74% of the cases (11). In concurrence with previous studies old age, female gender, and rural residents are at a greater risk of low vision and blindness (8-11). Although age is a biological risk factor for blindness and low vision the gender and residency differentials reflect on the social inequalities related in accessing health and health related services that leaves females and rural residents at a disadvantage. The childhood prevalence of blindness is also unacceptably high and accounts for about 6% of the total blindness. This is especially true when considering that large proportion of the causes of blindness is either avoidable or treatable.

The logistics and financial requirements to conduct large scale population based studies using qualified eye care professional is a major obstacle for repeated surveys to estimate the magnitude and cause of blindness in developing countries. Thus, most countries do not have recent estimates. In order to overcome this problem there are some practical recommendations. Dineen et al indicated that conducting surveys in the 50 year and above age group reduces the sample size requirements significantly and can provide reasonable estimates in the total population in a relatively less cost (12). Babalola et al also reported that fairly good information can be obtained for planning eye care by asking individuals about their visual status and the reasons for visual impairment (13). Masanganise et al also showed using village community development workers as reliable alternative in diagnosing blindness in the community when shortage of both ophthalmic trained personnel and funds are serious constraints in conducting blindness surveys (14). These studies suggest more frequent assessment of eye care needs in the population is necessary to properly manage eye care programs and can be made feasible by adapting simpler survey methods in resource constrained countries.

The major causes of blindness and low vision are either preventable or avoidable with time proven interventions that are feasible to implement if properly planned and adequate commitment is achieved from all stakeholders. Barriers for seeking eye care services include cost of surgery and distance to hospital (15). The gender inequality in accessing eye care services also deserves solution in order to reduce the burden of eye diseases on individual and societies. Without addressing the barriers that prevent women from utilizing services the mere availability of eye care services in the area may not alleviate the gender imbalance in the eye problems (16).

In conclusion, eye problems in Ethiopia are among the major public health challenges of the country and pose huge economic and social impact for affected individuals and to the society and the nation at large. The burden of disease and the number of individuals affected also indicate the formidable demand on health services (resources) to clear the backlog of cataract surgery. Thus, recognizing eye problems as major public health challenge; and implementing appropriate, affordable and accessible interventions by allocating adequate resources with emphasis to the disadvantaged segments of the population is needed urgently. The huge problem of blindness and low vision in children deserves a special focus because many of the conditions associated with childhood blindness are also causes of child mortality. The unfortunate fact is that up to 60% children in developing countries are likely to die within one year of becoming blind and this fact would not be any different in Ethiopia. Even if these children survive, the number of blind years of disability would be counted in millions of years and these years of blindness can be saved (17). The Federal Government of Ethiopia and relevant state organs need to enhance their commitment by providing resources and improving organizational capacity and capability at all levels to effectively and timely provide preventive and curative eye care services.

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