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# SCENARIO OF BLINDNESS: IMPLICATIONS FOR BLINDNESS CONTROL POLICY

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## ABSTRACT

This paper presents estimates of the prevalence of visual impairment and its causes, based on the best available evidence derived from recent studies. Estimates were determined from data on low vision and blindness. The burden of visual impairment is not distributed uniformly throughout the world: the least developed regions carry the largest share. Visual impairment is also unequally distributed across age groups, being largely confined to adults 50 years of age and older. A distribution imbalance is also found with regard to gender throughout the world: females have a significantly higher risk of having visual impairment than males. Notwithstanding the progress in surgical intervention that has been made in many countries over the last few decades, cataract remains the leading cause of visual impairment in all regions of the world, except in the most developed countries. Other major causes of visual impairment are, in order of importance, glaucoma, age-related macular degeneration, diabetic retinopathy and trachoma.

**KEYWORDS:** Visual Impairment, Glaucoma, Diabetic Retinopathy, Trachoma, Age- Related Macular Degeneration

## INTRODUCTION

We are slowly learning one of life's most important lessons: not just how to live longer, but also how to stay longer in good health with less dependent on others. However, still an estimated 10 percent of the world's population, some 600 million people, experience some form of impairment or disability. About 80 percent of people with disabilities live in developing countries (WHO, 2002). The majority of disabled persons is poor and experience difficulties in accessing basic health services, including rehabilitation services. This causes immobility, isolation, dependency, inequality, often premature death and increased poverty. Among all disabilities, visual disability is considered to be more important as sight is one of the five important senses possessed by man. The loss of this one sense appears far more of a catastrophic than the loss of any one of the others. Even the National Health Policy of India reiterated that blindness is an important public health problem. Blindness has profound human and socioeconomic consequences in all societies. Disabled people in India are a silent and invisible group in spite of their significant number. We know almost nothing about the existential experience of persons who live with visual disability.

In the 10th revision of the WHO International Statistical Classification of Diseases, Injuries and Causes of Death, 'low vision' is defined as visual acuity of less than 6/18 but equal to or better than 3/60, or a corresponding visual field loss to less than 20°, in the better eye with the best possible correction. 'Blindness' is defined as visual acuity of less than 3/60, or a corresponding visual field loss to less than 10°, in the better eye with the best possible correction. 'Visual impairment' includes both low vision and blindness. The first global estimate of the extent of visual impairment, in 1975, indicated that there were 28 million blind people. In the 1990s, it was estimated that the global population was likely to increase from 5.8

billion in 1996 to 7.9 billion by 2020, and most of the increase was expected to occur in the developing world. Estimates based on the 1990 world population indicated that there were 38 million blind people and almost 110 million with low vision. This estimate was later extrapolated, first to the 1996 world population of 45 million blind and 135 million people with low vision. The estimated prevalence of blindness in 1990 ranged from 0.08% of children to 4.4% of persons aged over 60 years, with an overall global prevalence of 0.7%. It was also estimated that at least 7 million people become blind each year and that the number of blind people worldwide was increasing by 1–2 million per year. In 2002, more than 161 million people globally were visually impaired due to eye diseases (refractive error as a cause of visual impairment was not included in this statistic); 124 million of who had low vision and 37 million were blind. The classification of WHO Member States into 17 subregions was carried out according to the Global Burden of Disease 2000 Project. Estimates of population size and structure were based on the 2002 demographic assessment of the United Nations Population Division, as used by the *World health report 2003.*

Recent survey results from 55 countries were selected (Table 1); in some countries there had been several surveys. They provided: clear, unequivocal definitions of visual impairment; both WHO and non-WHO definitions of visual impairment were acceptable if classifiable within the ICD-10 ranges of visual loss; cross-sectional design with a description of sample design and sampling plan; sample size; response rate; assessment of non-sampling errors; and a description of ophthalmic examinations and visual acuity testing.

In 2006, WHO released new global estimates, which, for the first time, included the global magnitude of visual impairment due to uncorrected refractive errors, accounting for an additional 153 million people. At least 13 million children (aged 5–15) and 45 million working-age adults (aged 16–49) were affected globally. Thus, according to WHO estimates, there are approximately 314 million people around the world whose vision is impaired, due either to eye diseases or uncorrected refractive Errors. Of this number, 45 million people are blind. This statistic does not include uncorrected presbyopia, the prevalence of which is unknown.

In India, total population of persons with disabilities is pegged around 2.1 percent of the total population by the Census (2001). The National Sample Survey Organization (NSSO) which collects data on the incidence and prevalence of disability at every 10 years intervals in 1991 quoted the percentage of persons with disability as 1.9 percent and the latest 2002 NSSO estimates 1.98 percent of the population having one or the other disability. Singh (2006) concluded that considering that one source of data is a sample survey and the other is through census, the variation is not too marked. Thus one could assume that people with disabilities constitute approximately 2 percent of the population.

According to surveys on the magnitude and causes of blindness, and surgical outcomes of cataract carried out in 1999-2002 and in 2003 by National Programme for Control of Blindness, the estimated prevalence of blindness was found to be 1.1 percent in the major states and 1.38 percent in the north-eastern States. Females were found to have a higher prevalence of blindness as compared to men, and rural respondents as compared to urban respondents. Cataract was the commonest cause of blindness (62.6 percent) followed by uncorrected refractive errors (19.7 percent); 16.6 percent individuals went blind after cataract surgery. Visual outcomes after cataract surgery were poorer among females, rural residents and those who underwent surgery at an older age (more than 70 years). The analysis of prevalence of visual disability by background characteristics found that the prevalence of both blindness and low vision is highest in rural areas as compared to urban areas.

The sex-wise differential shows that both blindness and low vision found to more prevalent among females than males. The prevalence of total blindness and low vision has found to be almost twice in illiterate persons compared to those who are literate. As the age of person increases the prevalence of blindness and low vision increases very sharply. The age at onset of blindness and low vision found the highest prevalence at after age 60. The major causes for this high prevalence of visual disability are old age, cataract and other eye diseases. In spite of this high prevalence of visual disability, just two-third of blind persons and those who had low vision had consulted to doctor and more than one-quarter did not take any type of treatment. Only 0.1 percent had attended special school.

Blindness can be a result of many causes, each of which may have implications for development. It may be a consequence of environmental factors that acted before, during or after birth, or it may be a genetic cause manifested as either a congenital or adventitious. The largest proportion of blindness is necessarily related to ageing. Although cataract is not a major cause of blindness in developed countries, globally it is still the leading cause, accounting for almost half of all cases, despite improved delivery of cataract surgical services in many parts of the world (Figure 1). Cataract is even more significant as a cause of low vision; it is the leading cause of low vision in all subregions.

According to the surveys, glaucoma is the second leading cause of blindness globally as well as in most regions; age-related macular degeneration is the third leading cause. Trachoma, other corneal opacities, childhood blindness and diabetic retinopathy are all of approximately equal magnitude (i.e. all roughly 4–5%). It is noteworthy that trachoma has decreased in significance as a cause of blindness as compared to earlier estimates. As would be expected given the growing number of people over 70 years of age, age-related macular degeneration is increasing in significance as a cause of blindness; it is the primary cause of blindness in the developed countries and the third leading cause worldwide. Corneal blindness may be primarily attributed to trachoma in areas in which this condition is known to be endemic.

Visual impairment is unequally distributed across age groups, as more than 82 percent of all blind people are 50 years of age or older, even though people in this age group represent only 19 percent of the world's population. Although the prevalence of blindness among children is about 10 times lower than that among adults, childhood blindness remains a high priority because of the expected number of years to be lived in blindness. About one-half of the estimated 1.4 million cases of blindness in children below the age of 15 could have been avoided. Studies consistently indicate that females in every region of the world and of all ages have a significantly higher risk for being visually impaired than males, mostly because of their longer life expectancy and, in poorer societies, because of their lack of access to services. More than 90% of the world's visually impaired people live in developing countries. Other risk factors include tobacco use, exposure to ultraviolet radiation, vitamin A deficiency, high body mass index and metabolic disorders.

WHO data on visual impairment due to eye diseases published in 2004 put the estimates in to a new perspective. Additional epidemiological data from various countries indicated that the number of people who were blind due to eye diseases was lower than that projected on the basis of the 1990 population. Thus, in many countries, a considerable decline in the prevalence of blindness was documented, due to socioeconomic development and better provision of eye-care services.

Nevertheless, an increasing number of people will be at risk of visual impairment as populations grow and age. As the prevalence of diseases that affect the eyes (e.g. diabetes mellitus) also continues to increase, more and more people will have potentially blinding conditions, such as age-related macular degeneration, diabetic retinopathy and glaucoma.

These are non-communicable, chronic eye diseases to which the principles of long-term care (including cost of treatment, compliance and adherence) apply.

Globally, cataract (opacification of the lens) is the single most important cause of blindness, and cataract surgery has been shown to be one of the most cost-effective health-care interventions. Mostly cataract is related to ageing and cannot be prevented, but cataract surgery and insertion of an intraocular lens are highly effective, resulting in almost immediate visual rehabilitation. In well-managed eye units, high-quality, high-volume surgery is possible, one ophthalmologist being able to undertake 1000–2000 or more operations a year, as long as there are adequate support staff, infrastructure and patients who are able and willing to access the facilities.

There are estimated to be almost 18 million people who are bilaterally blind from cataract, representing almost half of all causes of blindness due to eye diseases globally (Table 11). The proportion of blindness due to cataract among all eye diseases ranges from 5 percent in Western Europe, North America and the more affluent countries in the Western Pacific Region to 50 percent or more in poorer regions. The main Non-modifiable risk factor is ageing. Other frequently associated risk factors are injury, certain eye diseases, diabetes, ultraviolet irradiation and smoking. Cataract in children is due mainly to genetic disorders. Visually disabling cataract occurs far more frequently in developing countries than in industrialized countries, and women are at greater risk than men and are less likely to have access to services. There are two main surgical techniques for removing a cataract: extra capsular cataract extraction and phacoemulsification. Extra capsular cataract extraction can be done through a small incision, which does not usually require sutures, or through a standard incision closed by removable sutures. In phacoemulsification, an ultrasound probe is used to fragment the lens, which is aspirated through a small incision. There are three ways of correcting cataract, an eye with a surgically removed lens: spectacles, contact lenses or an intraocular lens. Thick spectacles are required for patients who have undergone intracapsular extraction, and this technique was widespread in the past. Contact lenses are not appropriate in most settings. An intraocular lens, implanted after the cataract has been removed, is the optimal method, as it eliminates the use of thick spectacles. Nevertheless, light spectacles are often necessary to compensate the loss of accommodation. Cataract is included in most national plans for the prevention of blindness, and cataract surgical rates are increasing in many countries. Cost-effective surgical techniques have been developed and tested and are being improved continuously.

There are estimated to be 153 million people with visual impairment due to uncorrected refractive errors, i.e. presenting visual acuity < 6/18 in the better eye, excluding presbyopia. Globally, uncorrected refractive errors are the main cause of visual impairment in children aged 5–15 years. The prevalence of myopia (short-sightedness) is increasing dramatically among children, particularly in urban areas of South-East Asia. The most frequently used options for correcting refractive errors are: spectacles, the simplest, cheapest and most widely used method; contact lenses, which are not suitable for all patients or environments; and corneal refractive surgery, which entails reshaping the cornea by laser.

Low-vision services are aimed at people who have residual vision that can be used and enhanced by specific aids. Low vision is currently defined as ‘visual acuity of < 6/18 down to and including 3/60 in the better eye’, from all causes. Many such persons require cataract extraction or refraction services. In 2009, the term ‘low vision’ will be deleted from the 10th revision of the ICD (ICD-10), leaving the terms ‘moderate visual impairment (presenting visual acuity of < 6/18 to 6/60)’ and ‘severe visual impairment (< 6/60 to 3/60)’, from all causes. Low-vision services are not available in many

countries, particularly developing countries, or are located only in major cities. It is estimated that less than 5% of people needing low-vision care have access to it, but there is considerable variation between regions and countries.

As the causes of blindness in children differ from those in adults, different control measures are needed. In low-income countries, high proportions of children are blind from preventable causes, which require community-based interventions. In all regions, children with treatable diseases, principally cataract, can have their sight restored. Children's' eyes cannot, however, be considered smaller versions of adults' eyes, and specific expertise and equipment are required. Unlike adults, children require long term follow-up after surgery, to manage complications and to prevent amblyopia ('lazy eyes'). The understanding and involvement of parents is critical. In all regions, children with irreversible visual loss must be assessed for low-vision services, early visual stimulation, rehabilitation or special education, depending on their age and level of residual vision. The causes of childhood blindness vary, but the main avoidable causes are: Corneal scarring in Africa and poorer countries in Asia; Cataract everywhere; Glaucoma everywhere; Retinopathy of prematurity in high- and middle-income countries and some cities in Asia; Refractive errors everywhere, but particularly in South-East Asia; and Low vision, which encompasses visual impairment and blindness from untreatable causes, in all regions. The main causes of blindness in children change over time. As a consequence of child survival programme (For example, integrated management of childhood illness), corneal scarring due to measles and vitamin A deficiency is declining in many developing countries, so that the proportion due to cataract is increasing.

Trachoma is the commonest infectious cause of blindness, is caused by Chlamydia trachomatis. Children who have the active stages of the disease are the reservoir of infection, while blindness, which occurs after repeated episodes of infection, principally affects adults. Boys and girls are equally affected by active infection, while blindness is more common in women. Trachoma is a condition of poverty and is a focal disease, affecting communities that have poor water supplies and sanitation and poor health services. The organism is transmitted from person to person through direct and indirect contact and by flies. Blindness can be prevented by surgery to correct in turning of the upper lid (trichiasis), while the infection and its transmission can be reduced with surgery, antibiotics, facial cleanliness and environmental change (the SAFE strategy). Trachoma is endemic in 55 countries: Afghanistan, Algeria, Australia, Benin, Brazil, Burkina Faso, Cambodia, Cameroon, Central African Republic, Chad, China, Côte d'Ivoire, Djibouti, Egypt, Eritrea, Ethiopia, Fiji, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, India, Islamic Republic of Iran, Iraq, Kenya, Kiribati, Lao People's Democratic Republic, Libyan Arab Jamahiriya, Malawi, Mali, Mauritania, Mexico, Morocco, Mozambique, Myanmar, Namibia, Nepal, Niger, Nigeria, Oman, Pakistan, Papua New Guinea, Senegal, Solomon Islands, Somalia, Sudan, Togo, Uganda, United Republic of Tanzania, Vanuatu, Viet Nam, Yemen, Zambia and Zimbabwe. The estimated number of affected people has fallen from 360 million in 1985 to about 80 million today. Trachoma affects the poorest and most remote rural areas of Africa, Asia, Central and South America, Australia and the Middle East. Updated reports on 36 countries are available, while 19 endemic countries have not yet reported data. There are approximately 10.6 million people with in turned eyelashes (entropion trichiasis), for which eyelid surgery is needed to prevent blindness. The majority of these people are women. An estimated 5.9 million adults are irreversibly visually impaired from corneal scarring due to trachoma.

Age-related macular degeneration is the commonest cause of blindness in industrialized countries. Visual loss from this condition is uncommon among persons under the age of 50, but its prevalence is likely to increase in absolute numbers globally as a consequence of population ageing. Age-related macular degeneration has two forms, 'wet'

and 'dry'. In most populations, the dry form is the more frequent, but it is less likely to lead to severe bilateral visual loss. The wet form is characterized by the development of abnormal new blood vessels deep to the sensory retina, which can leak or bleed, leading to marked loss of central vision; if bilateral, this can be very disabling. Each year after the onset of wet age-related macular degeneration in one eye, 15% of persons develop the wet form in their second eye. Current options for prevention are limited, but new treatments are being developed to preserve or restore vision in some patients with the wet form.

Age-related macular degeneration is responsible for 8.7% of all blindness (3 million persons) due to eye diseases, ranging from close to 0% in sub-Saharan Africa to 50% in industrialized countries. The number affected is expected to double by the year 2020 as a result of the ageing of the world's population. The main risk factors are age, race, smoking, a family history of the condition, hypertension, high cholesterol, high fat intake and high body mass index. The complement factor H gene has also been implicated. Photo-dynamic therapy (i.e. foveal ablation with a low-power laser in combination with a photosensitizing drug, verteporfin) can be offered to selected patients, but the long-term outcomes are not uniformly good. Sequential intravitreal injections of anti-vascular endothelial growth factor agents can improve vision or stabilize visual loss in selected patients, but this treatment is very expensive and is time-consuming for staff and patients. New anti-vascular endothelial growth factor agents are being investigated, and more research is needed. Surgical translocation of the macula and sub macular surgery are indicated only for selected patients, as surgery requires highly experienced vitreo-retinal surgeons, and the results are not always favourable. There is currently no treatment for dry age-related macular degeneration.

Diabetic retinopathy is a well-recognized complication of diabetes mellitus. Well-conducted clinical trials have shown that good control of diabetes and hypertension significantly reduces the risk for diabetic retinopathy, and there is evidence from studies spanning more than 30 years that treatment of established retinopathy can reduce the risk for visual loss by more than 90 percent. Once vision has been lost due to diabetic retinopathy, it usually cannot be restored, although some forms of retinopathy can be treated by complex vitreo-retinal surgery. Screening programmes for detecting diabetic retinopathy at a stage at which treatment can prevent visual loss and health education programmes are the mainstay of prevention of blindness due to diabetic retinopathy. Care for diabetic retinopathy is relatively expensive and requires properly trained eye-care professionals. The decisions made by each country are adapted to their resources, social expectations and available health-care infrastructure. Effective services for prevention and treatment of diabetic retinopathy can be provided only if adequate medical services for patients with diabetes mellitus are in place.

Glaucoma is not a single disease entity but a group of conditions characterized by damage to the optic nerve (detected by pathological cupping of the optic disc) and loss of the field of vision. The two main types are primary open-angle glaucoma and primary angle-closure glaucoma. Primary open-angle glaucoma is more frequent in whites and Afro-Caribbeans, while primary angle-closure glaucoma is more common in South-East Asia. Glaucoma is uncommon among persons under the age of 40, but the prevalence increases with age. Other risk factors include raised pressure inside the eye (intraocular pressure), a positive family history and belonging to a susceptible ethnic group. Primary open-angle glaucoma cannot be prevented, but acute attacks of primary angle-closure glaucoma and more chronic forms of the disease can be prevented by early detection, followed by laser treatment or surgery to the iris. As the early stages of both types of glaucoma are often asymptomatic, patients often present late, particularly in developing countries. Once vision has been lost, regardless of the type of glaucoma, it cannot be restored.

Primary open-angle glaucoma can be managed by long-term use of eye drops to reduce intraocular pressure or surgery (e.g. trabeculectomy) and should be followed up by long-term monitoring of the visual field, optic disc and intraocular pressure. Detection of eyes at risk of angle closure by assessment of anterior chamber depth or the configuration of the drainage angle of the eye, followed by treatment with laser or surgery to produce an iridotomy or iridectomy can prevent progression to angle-closure glaucoma. Treatment of established primary angle-closure glaucoma requires surgery or medication to reduce intraocular pressure, followed by long-term monitoring.

There are certain limitations for controlling visual impairment globally. The main limitations are lack of resources political will to address blindness as a global public health issue. In many poor rural districts, there is a dramatic lack of eye-care services, and, even where they are available, their quality is not always satisfactory. High-quality low-cost cataract service models are widely used in a number of countries, but their uptake in low-income countries is slow, due to local conditions such as the influence of the private sector and the presence of more expensive products on the market. There is Insufficient data on the prevalence and types of refractive errors in different populations and age groups and lack of qualitative research on the impact of refractive errors on quality of life, visual function and economic productivity. Provision of low-vision services is generally not favoured by eye-care providers because of the low economic gain. The need for low-vision services is often not fully recognized, owing to inadequate epidemiological data on the prevalence and causes of functional low vision. There is little evidence for the cost-effectiveness of low-vision care interventions. Communication and referral between eye-care, special education, rehabilitation and low-vision services are often inadequate. Glaucoma-associated visual impairment and blindness remain difficult to prevent because of the lack of methods to identify persons who are likely to develop substantial visual loss.

**Implications**

There are certain implications with the help of which we can fight against visual impairment and some of them are: establishment of comprehensive eye-care services, so that refraction services with provision of suitable correction tools are available at all levels, including during outreach activities; Training of human resources to ensure that high-quality refraction and optical service are available where needed; Improvement of public awareness and generate demand for services through community-based initiatives, primary eye care and school eye-health programmes; spectacles that are new, accessible and are of good quality should be provided specifically in low income settings; disseminate the existing curriculum and materials for training primary- and secondary-level personnel; establishment or promotion of low-vision services in tertiary- and secondary-level eye-care centres; establishment of networks with other global campaigns, such as those of the International Council for Education of People with Visual Impairment and the World Blind Union; provision of comprehensive services for children at all levels of service delivery; In areas where childhood blindness from preventable diseases is common awareness should be increased in the community primary health care should be encouraged; at the tertiary level, training and services should be provided for the management of surgically remediable visual loss from cataract, congenital glaucoma and corneal scarring, including long term follow up.

## CONCLUSIONS

Periodic estimations of the magnitude and causes of all categories of visual impairment are essential to improve global efforts aimed at monitoring and eliminating avoidable blindness and for use in priority-setting and resource allocation. Disaggregated, within-country data are important in ensuring greater equity in service provision and

monitoring. To this end, countries are encouraged to carry out periodic population-based surveys, particularly densely populated countries and countries in regions where data are scarce. They are advised to use the standardized WHO protocol (*3*) with the following refinements: adding the measure of presenting vision, to include visually disabling refractive errors; in those studies that use definitions other than those given in the WHO ICD-10, visual acuity consistent with the WHO definitions should also be recorded; and diagnosis and recording of the causes of low vision in addition to those of blindness. Particular attention should be paid to glaucoma and macular degeneration.

**Table 1: Studies Used for the Global Estimate of Visual Impairment**

| Subregion | Studies |
|---|---|
| Afr-D | Surveys from 13 countries (Benin, Cameroon, cape verde, Equatorial Guinea, Gambia, Ghana, Mali, Mauritania, Niger, Nigeria, Sierra Leone, Sudan, Togo) |
| Afr-E | Surveys from 6 countries (Central African Republic, Congo, Ethiopia, Kenya, South Africa, United Republic of Tanzania) |
| Amr- A | Surveys from 1 country (United States of America) |
| Amr- B | Surveys from 3 countries (Barbados, Brazil, Paraguay) |
| Amr- D | Survey from 1 country (Peru) |
| Emr- B | Surveys from 4 countries (Lebanon, Oman, Saudi Arabia, Tunisia) |
| Emr- D | Survey from 1 country (Morrocco) |
| Eur- A | Surveys from 7 countries (Denmark, Finland, Iceland, Ireland, Italy, Netherlands, United Kingdom) |
| Eur- B1 | Surveys from 2 countries (Bulgaria, Turkey) |
| Eur- B2 | Survey from 1 country (Turkmenistan) |
| Eur- C | No population based survey were identified |
| Sear- B | Surveys from 4 countries (Indonesia, Malaysia, Philippines, Thailand) |
| Sear- D | Surveys from 4 countries (Bangladesh, India, Nepal, Pakistan) |
| Wpr- A | Surveys from 1 country (Australia) |
| Wpr-B1 | Surveys from 2 countries (China, Mongolia) |
| Wpr-B2 | Surveys from 3 countries (Cambodia, Myanmmar, Vietnam) |
| Wpr- B3 | Surveys from 2 countries (Tonga, Vanuatu) |

Afr, WHO African Region; Amr, WHO Region of the Americas; Emr, WHO Eastern Mediterranean Region; Eur, WHO European Region; Sear, WHO

South-East Asia Region; Wpr, WHO Western Pacific Region.

Source: Global Burden of Disease 2000 Project (*10*).

**Table 2: Global Estimate of Visual Impairment by WHO Subregion, 2002**

| WHO Region | Total Population (Millions) | No. of Blind People (Millions) | Prevalence of Blindness (%) | No. of People with Low Vision (%) | Prevalence of Low Vision (%) | No. of Persons Visually Impaired (Millions) |
|---|---|---|---|---|---|---|
| Afr-D | 354.324 | 3.646 | 1.0 | 10.715 | 3.0 | 14.361 |
| Afr-E | 360.965 | 3.642 | 1.0 | 10.573 | 3.0 | 14.215 |
| Amr-A | 322.309 | 0.694 | 0.2 | 4.029 | 1.2 | 4.723 |
| Amr-B | 456.432 | 1.392 | 0.3 | 7.600 | 1.7 | 8.992 |
| Amr-D | 73.810 | 0.332 | 0.5 | 1.488 | 2.0 | 1.820 |
| Emr-B | 142.528 | 1.076 | 0.8 | 3.580 | 2.5 | 4.656 |
| Emr-D | 144.405 | 1.406 | 0.97 | 4.116 | 2.9 | 5.522 |
| Eur-A | 415.323 | 0.937 | 0.2 | 5.435 | 1.3 | 6.372 |
| Eur-B1 | 169.716 | 0.618 | 0.4 | 2.546 | 1.5 | 3.164 |
| Eur-B2 | 53.130 | 0.142 | 0.3 | 0.590 | 1.1 | 0.731 |
| Eur-C | 239.717 | 1.035 | 0.4 | 4.219 | 1.8 | 5.254 |

| Table 2: Contd., | | | | | | |
|---|---|---|---|---|---|---|
| Sear-B | 405.313 | 4.214 | 1.0 | 9.669 | 2.4 | 13.883 |
| Sear-D | 1394.045 | 8.344 | 0.6 | 28.439 | 2.0 | 36.782 |
| Wpr-A | 150.867 | 0.393 | 0.3 | 1.883 | 1.2 | 2.276 |
| Wpr-B1 | 1374.838 | 7.731 | 0.6 | 26.397 | 1.9 | 34.128 |
| Wpr-B2 | 148.469 | 1.229 | 0.8 | 2.898 | 1.9 | 4.127 |
| Wpr-B3 | 7.677 | 0.025 | 0.3 | 0.090 | 1.2 | 0.115 |
| World | 6213.869 | 36.857 | 0.57 | 124.264 | 2.0 | 161.121 |

Afr, WHO African Region; Amr, WHO Region of the Americas; Emr, WHO Eastern Mediterranean Region; Eur, WHO European Region; Sear, WHO South-East Asia Region; Wpr, WHO Western Pacific Region.

**Source:** Global Burden of Disease 2000 Project (*10*).

**Total Estimated Population**

**Table 3: Blind 20, 13, 400**

| Male | Female | Rural | Urban |
|---|---|---|---|
| 9, 28, 700 | 10, 84, 700 | 16, 03, 000 | 4, 10, 400 |

**Source:** NSSO 2002

**Table 4: Low Vision 8, 13, 300**

| Male | Female | Rural | Urban |
|---|---|---|---|
| 3, 69, 300 | 4, 44, 000 | 6, 54, 500 | 1, 58, 800 |

**Source:** NSSO 2002

**Table 5: Age Wise Distribution of Visually Impaired Persons**

| Age Group | Rural | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|
| | Blind | | Low Vision | | Blind | | Low Vision | |
| | In No | % | In No | % | In No | % | In No | % |
| 0-4 | 15, 960 | 1.0 | 2, 404 | 0.4 | 5, 735 | 1.0 | 914 | 0.6 |
| 5-9 | 23, 940 | 2.0 | 5, 771 | 0.9 | 13, 954 | 2.0 | 2, 924 | 2.0 |
| 10-14 | 25, 935 | 2.0 | 10, 580 | 2.0 | 15, 674 | 2.0 | 1, 827 | 1.1 |
| 15-19 | 27, 930 | 2.0 | 10, 099 | 1.0 | 8, 411 | 2.0 | 2, 376 | 2.0 |
| 20-24 | 32, 419 | 2.0 | 11, 061 | 2.0 | 10, 704 | 2.0 | 3, 289 | 2.0 |
| 25-29 | 33, 915 | 2.0 | 8, 175 | 1.0 | 8, 219 | 2.0 | 3, 655 | 2.0 |
| 30-34 | 38, 404 | 2.0 | 7, 694 | 1.0 | 5, 735 | 2.0 | 3, 472 | 2.0 |
| 35-39 | 37, 407 | 2.0 | 15, 389 | 2.4 | 10, 131 | 2.0 | 3, 655 | 2.0 |
| 40-44 | 63, 841 | 4.0 | 20, 678 | 3.1 | 15, 101 | 4.0 | 5, 482 | 4.0 |
| 45-49 | 91, 272 | 6.0 | 31, 258 | 5.0 | 20, 071 | 6.0 | 7, 127 | 5.0 |
| 50-54 | 132, 669 | 8.0 | 59, 631 | 9.0 | 34, 789 | 8.0 | 17, 908 | 11.3 |
| 55-59 | 214, 964 | 13.0 | 112, 530 | 17.2 | 54, 096 | 13.0 | 22, 294 | 14.0 |
| 60 & above | 864, 343 | 54.0 | 359, 230 | 55 | 207, 780 | 54.0 | 83, 877 | 52 |

**SOURCE:** NSSO REPORT NO 485-DISABLE PERSONS IN INDIA, 2002 (JULY- DEC)

**Table 6: Educational Status of Visually Impaired Persons**

| | Not Literate | | Primary | | Middle | | Sec & Above | |
|---|---|---|---|---|---|---|---|---|
| | In No. | % | In No. | % | In No. | % | In No. | % |
| **RURAL** | | | | | | | | |
| Blind | 13,81,786 | 86.2 | 1,81,139 | 11.3 | 59,311 | 3.7 | 36,869 | 2.3 |

| Table 6: Contd., | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Low Vision | 5,06,583 | 77.4 | 1,02,756 | 15.7 | 25,525 | 3.9 | 17,671 | 2.7 |
| | 18,88,369 | | 2,83,895 | | 84,836 | | 54,540 | |
| **URBAN** | | | | | | | | |
| Blind | 2,24,078 | 54.6 | 1,05,472 | 25.7 | 31,190 | 7.6 | 48,837 | 11.9 |
| Low Vision | 91,468 | 57.6 | 37,318 | 23.5 | 11,592 | | 18,103 | 11.4 |
| **Total** | **3,15,546** | | **1,42,790** | | **42,782** | **7.3** | **66,940** | |

**SOURCE:** NSSO REPORT NO 485-DISABLE PERSONS IN INDIA, 2002 (JULY- DEC)

**Table 7: Employment Status of Visually Impaired Persons**

| | Employed | | Unemployed | | Out of Labour Force | |
|---|---|---|---|---|---|---|
| **Male** | **In No.** | **%** | **In No.** | **%** | **In No.** | **%** |
| Blind | 1, 38, 376 | 14.9 | 3, 715 | 0.4 | 7, 86, 609 | 84.7 |
| Low vision | 12, 238 | 33.1 | 2, 216 | 0.6 | 2, 44, 846 | 66.3 |
| **Female** | **In No.** | **%** | **In No.** | **%** | **In No.** | **%** |
| Blind | 44, 473 | 4.1 | 1, 085 | 0.1 | 10, 36, 973 | 95.6 |
| Low Vision | 30, 636 | 6.9 | - | - | 4, 13, 364 | 93.1 |

**SOURCE:** NSSO REPORT NO 485-DISABLE PERSONS IN INDIA, 2002 (JULY- DEC)

**Table 8: State Wise Distribution of Visually Impaired Persons**

| State | Blind | | Low Vision | |
|---|---|---|---|---|
| | In No | % | In No | % |
| J & K | 67, 126 | 3.3 | 30697 | 3.8 |
| Himachal Pradesh | 1, 06, 544 | 5.3 | 42, 329 | 5.2 |
| Punjab | 65, 956 | 3.3 | 18, 741 | 2.3 |
| Chandigarh | 15, 611 | 0.8 | 5, 816 | 0.7 |
| Uttaranchal | 73, 761 | 3.7 | 25, 204 | 3.1 |
| Haryana | 51, 516 | 2.6 | 10, 340 | 1.3 |
| Delhi | 11, 708 | 0.6 | 3, 877 | 0.5 |
| Rajasthan | 63, 224 | 3.1 | 11, 956 | 1.5 |
| U.P | 93, 665 | 4.7 | 20, 680 | 2.5 |
| Bihar | 55, 028 | 2.7 | 16, 479 | 2.0 |
| Sikkim | 23, 416 | 1.2 | 16, 156 | 2.0 |
| Arunachal Pradesh | 46, 832 | 2.3 | 39, 744 | 4.9 |
| Nagaland | 33, 173 | 1.6 | 33, 928 | 4.2 |
| Manipur | 21, 855 | 1.1 | 16, 802 | 2.1 |
| Mizoram | 12, 489 | 0.6 | 11, 632 | 1.4 |
| Tripura | 28, 880 | 1.4 | 3, 231 | 0.4 |
| Meghalaya | 52,, 296 | 2.6 | 45, 560 | 5.6 |
| Assam | 43, 710 | 2.2 | 15, 187 | 1.9 |
| West Bengal | 71, 810 | 3.6 | 29, 727 | 3.7 |
| Jharkhand | 45, 271 | 2.2 | 7, 432 | 0.9 |

Table 9

| State | Blind | | Low Vision | |
|---|---|---|---|---|
| | In No | % | In No | % |
| Orissa | 11, 4349 | 5.7 | 7, 8842 | 9.7 |
| Chattisgarh | 66, 346 | 3.3 | 28, 758 | 3.5 |
| Madhya Pradesh | 78, 834 | 3.9 | 17, 126 | 2.1 |
| Gujarat | 54, 638 | 2.7 | 11, 956 | 1.5 |
| Daman & Diu | 11, 708 | 0.6 | 22, 619 | 2.8 |
| D & N Haveli | 42, 539 | 2.1 | 3, 554 | 0.4 |
| Maharashtra | 87, 420 | 4.3 | 22, 942 | 2.8 |
| Andhra Pradesh | 83, 908 | 4.2 | 36, 190 | 4.4 |
| Karnataka | 81, 176 | 4 | 33, 605 | 4.1 |
| Goa | 14, 440 | 0.7 | 32, 635 | 4 |
| Lakshwadeep | 87, 811 | 4.4 | 26, 173 | 3.2 |
| Kerala | 68, 687 | 3.4 | 10, 340 | 1.3 |
| Tamil Nadu | 72, 590 | 3.6 | 32, 959 | 4.1 |
| Pondicherry | 1, 32, 301 | 6.6 | 20, 034 | 2.5 |
| Andaman & Nichobar | 32, 783 | 1.6 | 30, 050 | 3.7 |
| | 20, 13, 400.00 | | 8, 13, 300.00 | |

**Source:** NSSO REPORT NO 485- DISABLE PERSONS IN INDIA, 2002 (JULY- DEC)

**Table 10: Causes of Visual Impairment (Low Vision) in Rural and Urban Areas in India:**

| Sl. No | Cause | Rural | | Urban | |
|---|---|---|---|---|---|
| | | In No. | % | In No. | % |
| 1 | Sore Eyes | 1964 | 0.3 | 635 | 0.4 |
| 2 | Severe diahorrea | 3272 | 0.5 | 1112 | 0.7 |
| 3 | Cataract | 183260 | 28 | 56850 | 35.8 |
| 4 | Glaucoma | 20944 | 3.2 | 6352 | 4 |
| 5 | Corneal Opacity | 31416 | 4.8 | 2223 | 1.4 |
| 6 | Other Eye Disease | 71341 | 10.9 | 25884 | 16.3 |
| 7 | Small Pox | 6545 | 1 | 1429 | 0.9 |
| 8 | Burns | 1963 | 0.3 | 476 | 0.3 |
| 9 | Injury | 28798 | 4.4 | 9210 | 5.8 |
| 10 | Medical & Surgical Intervention | 11127 | 1.7 | 4446 | 2.8 |
| 11 | Old age | 169516 | 25.9 | 31442 | 19.8 |
| 12 | Others | 22253 | 3.4 | 8258 | 5.2 |
| 13 | Not Known | 71995 | 11 | 9369 | 5.9 |

**Source:** NSSO REPORT NO 485-DISABLE PERSONS IN INDIA, 2002 (JULY- DEC)

**Table 11: Estimates of Numbers and Proportions of Persons in Various WHO Regions Who are Blind Due to Cataract**

| Region | No. of Countries | No. of Persons Blind Due to Eye Disease (x 1000) | Person Blind Due to Cataract (x 10000 | Person Blind Due to Cataract (%) |
|---|---|---|---|---|
| Afr-D | 26 | 3646 | 1823 | 50 |
| Afr-E | 20 | 3642 | 2003 | 55.0 |
| Amr-A | 3 | 694 | 35 | 5.0 |
| Amr- B | 26 | 1392 | 557 | 40.0 |
| Amr- D | 6 | 332 | 194 | 58.5 |
| Emr- B | 13 | 1076 | 527 | 49.0 |

| Table 11: Contd., | | | | |
|---|---|---|---|---|
| Emr- D | 9 | 1406 | 689 | 49.0 |
| Eur- A | 26 | 937 | 47 | 5.0 |
| Eur- B1 | 16 | 618 | 176 | 28.5 |
| Eur- B2 | 16 | 142 | 50 | 35.5 |
| Eur- C | 9 | 1035 | 248 | 24.0 |
| Sear- B | 3 | 4214 | 2444 | 58.0 |
| Sear- D | 7 | 8344 | 4255 | 51.0 |
| Wpr- A | 5 | 393 | 20 | 5.0 |
| Wpr- B1 | 22 | 7731 | 3750 | 48.5 |
| Wpr- B2 | 22 | 1229 | 799 | 65.0 |
| Wpr- B3 | 22 | 25 | 16 | 65.0 |
| Total | 192 | 36856 | 17634 | 47.8 |

Afr, WHO African Region; Amr, WHO Region of the Americas; Emr, WHO Eastern Mediterranean Region; Eur, WHO European Region; Sear, WHO South-East Asia Region; Wpr, WHO Western Pacific Region.

Source: Global Burden of Disease 2000 Project (*10*).

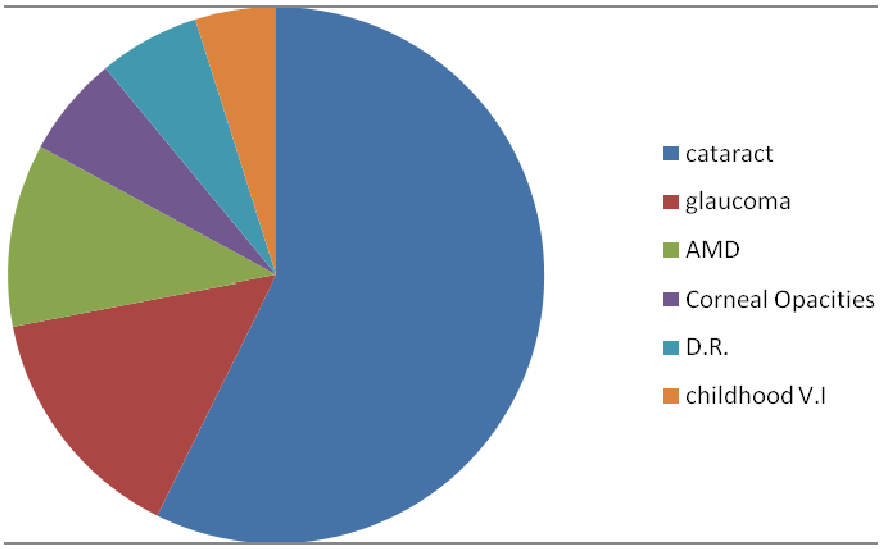


**Figure 1: Global Causes of Blindness Due to Eye Diseases, Excluding Refractive Errors**

**Source:** Vision 2020 global initiative for the elimination of avoidable blindness: action PLAN 2006–2011

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