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# LEADING CAUSES OF BLINDNESS WORLDWIDE

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## SUMMARY

The main causes of blindness and visual disabilities, as described in documents published by the World Health Organization (WHO), are discussed.

## RÉSUMÉ

Les causes principales de la cécité et de la déficience visuelle sur base de documents établis par l'Organisation Mondiale de la Santé (OMS), sont discutées.

## SAMENVATTING

De voornaamste oorzaken van blindheid en slecht zien worden besproken op basis van documenten die gepubliceerd worden door de Wereldgezondheidsorganisatie.

## KEY-WORDS

Blindness, visual disability, avoidable blindness, non avoidable blindness, World Health Organization

## MOTS-CLÉS

Cécité, déficience visuelle, cécité évitable, cécité non - évitable, Organisation Mondiale de la Santé

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One of the main functions of the World Health Organization (WHO) is to give worldwide guidance in the field of health (35). Blindness is defined as visual acuity of less than 3/60 (0.05) or corresponding visual field loss (a field less than 10°) in the better eye with best possible correction. This corresponds to loss of walk-about vision. Low vision corresponds to visual acuity of less than 6/18 (0.3) but equal to or better than 3/60 (0.05) in the better eye with the best possible correction (43).

There are currently 45 million people blind and 135 million people with low vision. The global blindness prevalence was estimated to be 0.7 % in 1990. Of this global burden of blindness 90 % is born by developing countries and 80 % is avoidable (preventable or treatable) with applying existing knowledge and technology. Blindness is also more prevalent in the older age groups, largely as a result of non-communicable diseases. The number of blind increases every year by 2 million and is expected to double by the year 2020 (6, 17, 25, 40).

In order to drastically reduce the global burden of blindness the WHO launched an initiative to combat and eliminate avoidable blindness. The name of that initiative is VISION 2020: THE RIGHT TO SIGHT. Five conditions have been identified as immediate priorities within the framework of VISION 2020. These are cataract, trachoma, onchocerciasis, and refractive errors and low vision (17, 23).

## AVOIDABLE BLINDNESS

### THE THREE MAIN CAUSES OF BLINDNESS

Cataract, trachoma and glaucoma are responsible for more than 70 % of the global blindness (34, 40).

#### CATARACT

Cataract, a loss of the normal transparency of the crystalline lens due to an opacity, is responsible for half of all blindness worldwide, and is largely related to the ageing process (the older a person, the greater the chance of developing a cataract) all over the world (4). Therefore cataract is an universal cause of blindness. There

is no prevention for cataract (5). Cataract surgery, including the implantation of an intra-ocular lens, may restore the visual acuity to near normal levels (23). The cost-effectiveness of cataract surgery has been demonstrated worldwide. A real restoration of the vision and a real improvement in the quality of life is obtained; furthermore adults can return to their work (15). That is why the volume of cataract surgery has increased worldwide (22).

The number of cataract operations per million population per year (Cataract Surgical Rate) varies from country to country and even within countries, ranging from an estimated 5000 in the USA to approximately 200 in the whole of Africa (7). In Europe cataract surgery with implantation of an intra-ocular lens is done routinely. The intra-ocular lens is available in Belgium at a price of € 157.66 (3). It has been estimated that India has 11.9 million people in urgent need of cataract surgery (2). In India only 11% of all cataract surgery is done with implantation of an intra-ocular lens, which is available at a price of US\$ 10 (25). China has about 18% of the world's blind and each year an estimated 450 000 become blind. Where several years ago trachoma was the main cause of blindness, today cataract accounts for approximately 50% of China's blind (36). In Africa and China less than 10% of the cataract patients receive surgical treatment. It is certain that in the poorer countries huge efforts will be necessary in order to provide cataract surgery with lens implantation to all those in need. The WHO estimates the number of cataract operations in 2000 to be 12 million and predicts that in 2020 32 million cataract operations will be performed. This increase in volume of cataract surgery will be a consequence of the increased number of elderly people and the worldwide increase in services (particularly in the developing countries) (7, 22, 29, 40).

#### TRACHOMA

Trachoma is responsible for 6 million blinded people or 15% of world's blindness. There are some 146 million cases of active disease due to infection with *Chlamydia trachomatis*. Repeated eye infections cause trichiasis and hence corneal blindness. Trachoma is common in areas of the world that are socio-economically de-

prived of basic needs in housing, health, water and sanitation. There is no medical treatment once the cornea has lost its transparency. Trachoma can be prevented through the implementation of the "SAFE strategy": surgery for trichiasis, azithromycin (antibiotic treatment), facial cleanliness and environmental improvement (hygiene) (8). Trachoma occurred also in Belgium before world war I and disappeared even before the antibiotics were discovered due to better environmental and hygienic conditions. It should therefore be understood that trachoma will only disappear if all four elements of the treatment are implemented. The WHO predicts that trachoma will disappear as a blinding disease (1, 13, 14, 17, 27, 40).

#### GLAUCOMA

Glaucoma is responsible for 5.2 million blind people or 13.50 % of the total burden of world blindness and is therefore considered to be the third largest cause of blindness worldwide. According to Thylefors and Négrel (24) glaucoma is not a single disease but rather a group of disorders that have common features such as cupping and atrophy of the optic disc, characteristic visual field loss and often an increased intra-ocular pressure. Glaucoma is more common in populations of African or Asian heritage. There is no preventive treatment for glaucoma, but visual loss can be avoided if glaucoma is detected and treated at an early stage. All people should be instructed about this disease because people who are aware of this disease are more motivated to have them screened for this condition and all people should have their eye pressure checked regularly (certainly when there is a predisposition for glaucoma). It is an example of health education thereby reducing visual impairment and reducing cost of eye care. In Africa at least half of eyes are already blind at first presentation (13).

Tonometry alone does not detect all cases of glaucoma, therefore it is to be hoped that new techniques for the early detection of glaucoma will improve the outcome of this disease (23, 40).

In Belgium glaucoma, diabetic retinopathy and trauma are the main causes of avoidable blindness.

## OTHER CAUSES OF BLINDNESS

### CHILDHOOD BLINDNESS

Childhood blindness is a priority area, considering the number of years the visual handicap plays a role, the high frequency of developmental anomalies and the fact that many of the conditions associated with blindness in children are also causes of child mortality (9). Each year, an estimated half a million children go blind, mostly in the poorest countries of Asia and Africa, of whom up to 60% die in childhood. Seventy-five per cent of these children suffer from Vitamin A deficiency, which causes night blindness, dry eye syndrome, an increased susceptibility to ocular infections and a higher risk of dying from infections due to an impaired immune system. Vitamin A deficiency is considered to be the main cause of childhood blindness. There are still 78 countries that have children with vitamin A deficiency (41). Malnutrition is a contributing factor in half of all childhood deaths (32). Vitamin A deficiency can be corrected by supplementation of vitamins or by teaching the people to change their diet. Another way of dealing with childhood blindness is to take care that all children get the necessary vaccinations at the right time. The combination of measles vaccination and vitamin A supplementation has been one of the major success stories in reducing death from infectious diseases. Worldwide, corneal scarring is the single most important cause of avoidable paediatric blindness, followed by cataract and retinopathy of prematurity (ROP). ROP occurs in babies who survive very low birth weight and is related to the response of immature retinal vasculature to high oxygen exposure. The creation of neonatology units in the western world but also in larger cities of developing countries has increased dramatically the survival of premature babies. However these children need careful ophthalmologic monitoring in order to allow the early detection and treatment of ROP and thus avoid its dramatic complications (11).

### ONCHOCERCIASIS (RIVER BLINDNESS)

Onchocerciasis is caused by *Onchocerca volvulus*, a parasitic worm that lives for up to 14 years in the human body. Each adult female worm produces millions of microfilariae that mi-

grate throughout the body and give rise to a variety of symptoms: serious visual impairment due to an intense inflammatory reaction caused by the dead of the microfilaria in the eye; lesions of the skin; lymphadenitis and general debilitation.

There are 120 million people worldwide who are at risk of onchocerciasis. A total of 18 million people are infected of whom 99% are in Africa (13). Of those infected, over 6.5 million suffer from dermatitis and 270 000 are blind. Onchocerciasis is often called "river blindness" because this filarial disease may cause blindness and because the black flies that transmit the disease breed on rapid flowing streams. Onchocerciasis may start one year after a bite of the black fly (39).

Onchocerciasis constitutes a serious obstacle to the socio-economic development, as many people do not want to live next to these rapid flowing streams for fear of becoming blind because of infection. And these rapid flowing streams turn the grounds in the vicinity into fertile areas. If these fertile grounds are not used for agriculture that means that large parts of these countries are not contributing to the economy and welfare.

The treatment of this disease is:

- 1) by eliminating the black flies through application of selected insecticides through aerial spraying of breeding sites in fast-flowing rivers.
- 2) by killing the larval worms with Ivermectin, a safe and effective medication (one dose a year is distributed free of charge to all those who need it) (40).

The WHO hopes that this disease will disappear before the year 2010 and that will happen at a cost of less than US\$ 1 per year for each protected person. The success of the control of onchocerciasis in eleven West African countries proves that disease control can be an economic investment with exceptionally high returns (27, 39).

#### DIABETES MELLITUS

Diabetes is a disease that in the long-term may lead to complications such as blindness, kidney failure and limb amputation, as well as to heart disease and stroke (31). After 15 years of diabetes, approximately 2% of people become blind while about 10% develop severe vi-

sual handicap. Loss of vision and blindness in persons with diabetes is the leading cause of blindness and visual disability in adults in economically developed societies, such as Belgium. India has the highest number of diabetics in the world. In Europe about 22.5 million adult people, 5% of the population, are diabetic and worldwide an estimated 150 million people. The WHO predicts a rise to 300 million by 2025 due to ageing, unhealthy diets, the fact that unhealthy food is frequently cheaper, obesity and a sedentary lifestyle.

Most of the direct costs of diabetes result from its complications. And, if the increase of diabetes and its complications occurs as predicted by the WHO, the financial implications for the health services will be disastrous (37). Loss of vision due to diabetic retinopathy can often be prevented by regular eye examinations and timely intervention with laser treatment or surgery (19, 23, 40). Screening of people with diabetes is cost effective. A recent study has demonstrated that diet, good metabolic control, assiduous treatment of arterial hypertension, correction of hyperlipidemia and a less sedentary life style can also delay the onset and progression of diabetic retinopathy (20, 21). In Belgium diabetic patients have access to all the necessary care to prevent the complications of diabetic retinopathy. In developing countries such care is inaccessible to the majority of the population.

#### OCULAR INJURIES

Ocular trauma is a common cause of visual loss and is known to be the most common cause of unilateral loss of vision. Each day eye injuries occur that cause suffering, medical costs and one or more days of restricted activity. In developing countries, the problem of injuries is more severe as there is often a delay before these eye injuries are handled in the proper way. Ocular trauma is the cause of bilateral blindness in more than one million people (16). Ocular trauma can be prevented by risk appreciation and avoidance, widespread wearing of high-performance spectacles or protective goggles, appropriate occupational processing and shielding, extension of on-the-job safety to the home environment and the application of modern principles of surgical salvage (12).

## LEPROSY

Leprosy is a chronic infection caused by *Mycobacterium Leprae* (Hansen - 1873) that mainly affects the skin, the peripheral nerves, the mucosa of the upper respiratory tract and also the eyes. In Europe the prevalence of leprosy declined steadily since the 14<sup>th</sup> century (26, 27). At the beginning of 2000, the prevalence rate at the global level was around 1.25/10000 and the number of leprosy patients was reported as about 640.000. The most affected area is India. It has been estimated that there are some 250 000 blind from the disease. The WHO ensures that all leprosy patients have free and equal access to Multiple Drug-Therapy, the most modern treatment available, that cures leprosy within twelve months. The WHO elimination strategy has led to an 85% reduction of leprosy prevalence over 15 years: Multiple Drug-Therapy had cured more than 10 million patients by the end of 1999. There is real hope that leprosy will disappear as a cause of blindness, although there are momentarily 24 countries where leprosy remains a public health problem (30, 42).

It is not really understood why eye disease continues to progress in leprosy patients that show no sign of active infection with *Mycobacterium Leprae*.

## NON AVOIDABLE BLINDNESS

Age-related maculopathy (ARM) is the most common disorder in the group of non-avoidable causes of visual loss (28). It is also an universal cause of visual loss. Hogan sounded a warning note 30 years ago that the increase in the prevalence of ARM due to aging of the population will become a major economical and social problem (10). More than 25% of people over 80 years may have the condition. There is not yet a preventive treatment that has a significant impact on blindness due to ARM. There is no therapy for the dry form of the late stage of ARM. There are limited forms of therapy with the objective of limiting the visual loss by destroying new vessels arising in the choroid (the wet form of the late stage of ARM). That is why there is a need for more effort to find a way to preserve a healthy macula in the elderly (18,

23). Provision of low vision care to enhance the use of residual vision of people with ARM or other eye diseases is one of the five objectives of VISION 2020, an ambitious program of the WHO to help those most in need of visual rehabilitation (33, 38).

## CONCLUSION

There is real hope that the mass of blindness and visual impairment will decrease considerably due to steady efforts of the WHO and its partners. That is true for blindness due to cataract, malnutrition and infectious disease. There is need for more research to fight diseases such as glaucoma and ARM. In cases of diabetes mellitus prevention through treatment of arterial hypertension, education, a less sedentary life and a better diet may improve drastically patients' quality of life.

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