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Visual impairment and blindness: an overview of prevalence and causes in Brazil

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ABSTRACT

Our purpose is to provide a summary overview of blindness and visual impairment on the context of recent Brazilian ocular epidemiologic studies. Synthesis of data from two cross-sectional population-based studies – the São Paulo Eye Study and the Refractive Error in School Children Study is presented. 3678 older adults and 2441 school children were examined between July 2004 and December 2005. Prevalence of blindness in older adults using presenting visual acuity was 1.51% decreasing to 1.07% with refractive correction. The most common causes of blindness in older adults were retinal disorders, followed by cataract and glaucoma. In school children, the prevalence of uncorrected visual impairment was 4.82% decreasing to 0.41% with refractive correction. The most common cause of visual impairment in school children was uncorrected refractive error. Visual impairment and blindness in Brazil is an important public health problem. It is a significant problem in older Brazilians, reinforcing the need to implement prevention of blindness programs for elderly people with emphasis on those without schooling. In school-children cost-effective strategies are needed to address a readily treatable cause of vision impairment – prescription and provision of glasses.

Key words: blindness, visual impairment, prevalence, population-based, ocular epidemiology.

INTRODUCTION

Visual impairment and blindness have a significant impact on the socioeconomic development of individuals and societies. Their consequences are an important public health issue with greater impact in the developing countries, where 80% of the world blindness occurs (Congdon et al. 2003). Visual impairment, which may be defined as blindness (best-corrected vision of $< 20/400$ in the better vision eye, by the World Health Organization [WHO]) or low vision (best-corrected vision $< 20/60$ in the better vision eye according to WHO), is one of the most common disabilities: currently, there are worldwide an estimated 37 million people with blindness and 124 million people with low vision (Resnikoff et al. 2004). Most of them have lost their sight to diseases that are treatable or preventable (Pizzarello et al. 2004).

The number of individuals with blindness might reach 76 million by 2020. The most significant factor is the decline in both mortality and fertility rates, contributing to a rapid aging of populations in most countries (West and Sommer 2001). More than 82% of all blind persons are 50 years of age or older. Given projected demographic changes and population growth, the incidence of chronic, non-communicable diseases affecting eyesight is expected to increase (Resnikoff et al. 2004).

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To reduce this estimated doubling of blind cases, a lot of effort will be required in the future. In response to this global need, the WHO launched in 1999 the Vision 2020: The Right to Sight, an initiative in partnership with non-governmental organizations (NGOs) and eye care organizations (Pararajasegaram 1999). Vision 2020 aims to eliminate avoidable blindness in the world by 2020 and targets the world's leading causes of avoidable visual impairment (Pizzarello et al. 2004). Analysis of global epidemiological data on the pattern of blindness indicates that up to 75% of the cases are avoidable. Avoidable blindness is defined as blindness which could be either treated or prevented by known, cost-effective means. Among the main causes of avoidable blindness are cataract, refractive errors (myopia, hyperopia and astigmatism), glaucoma, diabetic retinopathy and age-related macular degeneration.

Prevention of avoidable visual impairment leads to substantial long-term savings in health-care and social expenditures, in proportion to the number of individuals who no longer need medical or social assistance. Savings also accrue from the significantly reduced commitment made by family members caring for a visually impaired person. There is a direct link between the social and economic deprivation experienced by visually impaired individuals (specifically those in lower-income countries) and their ability to seek and obtain medical care. The resulting downward socioeconomic spiral can be reversed through widely available, appropriate, cost-effective preventive and curative interventions (WHO 2006).

Since the prevention of blindness and visual impairment is a high priority topic in public health, there is a continuing need for population-based studies to provide an up-to-date characterization of the magnitude and nature of the blindness problem. Societal changes and medical advances in the last decades have resulted in corresponding changes in the burden of blindness and visual impairment. Progressive urbanization, longer life expectancy, and behavioral changes in many parts of the world have contributed to an increase of newly emergent blindness causes, such as diabetic retinopathy and age-related macular degeneration, and a decrease of classical causes, such as oncocerchiasis, trachoma and xerophthalmia. Identification of the prevalence and causes of visual impairment and blindness are crucial for the establishment of local programs and supra-national, continental and world prevention strategies. This information is of critical importance for both scientists and international agencies working in the field.

Brazil is an example of a country which experienced important social changes in the last decades of the 20th century, with massive urbanization and the implementation of modern medical care radically shifting the public health landscape. Several medical areas had beneficial impact, among them successful programs for HIV infection prevention and a new initiative to improve access to modern cataract surgery.

Due to initiatives to improve access to modern cataract surgery implemented by health authorities in the late 90's, Brazil has built a reputation of positive trend in eye care delivery services into the international prevention of blindness community. This fact, in addition to the scarcity of reliable epidemiological data, had motivated WHO to choose Brazil as a target country to perform an extensive population-based eye survey. The objective of this ambitious project was to investigate prevalence and causes of visual impairment and blindness in two specific populations: older adults and school-age children.

This article aims to review current knowledge for the main causes of visual loss, with a focus on recent population-based studies performed in a low-middle income region of São Paulo city in older adults and school-age children.

Definition of Blindness and Visual Impairment

Blindness is defined either in terms of best-corrected distance visual acuity (the most appropriate refractive correction) or presenting distance visual acuity (the individual's current refractive correction) in the better eye. Also of importance in the definition of blindness is the level of visual acuity that is applied. Visual acuity levels of $< 20/400$ or $< 20/200$ in the better eye have been commonly used to define blindness. Visual impairment is defined as visual acuity of $20/60$ or less in the better acuity eye (Dandona and Dandona 2006).

Many population-based surveys from less developed countries have reported blindness rates using visual acuity level less than 20/400 (Pascolini et al. 2004). The more developed countries have often used visual acuity less than 20/200 to define blindness (Congdon et al. 2004, Laitinen et al. 2005, Taylor et al. 2005). In modern times, the importance of visual tasks, such as driving and reading, means that vision loss should be classified in several visual categories for a thorough description of visual impairment spectrum. In a recent prevalence survey in elderly urban population in Brazil, following previous epidemiological surveys in developing countries, several visual impairment categories were studied (Araújo-Filho et al. 2008).

Prevalence and Causes of Visual Impairment and Blindness

The prevalence of blindness is defined as the number of affected individuals per hundred population in a given period of time. It can vary considerably among countries depending on socio-economic factors and available health and eye care services. A prevalence of 0.25 in the general population is expected in communities with good economy and health services, rising to 1.0 or more in communities with very poor economy and health services. The difference in prevalence is mainly because blindness from cataract, refractive errors, and corneal scarring (trachoma, corneal infections, and vitamin A deficiency) has been eliminated in communities with good economy and eye services. The problem of cataract blindness in the industrialized world has been largely solved through the availability of affordable, high-quality surgery with intraocular lens (IOL) implantation, resulting in cataract-care delivery that equals or is greater than the incidence of visually disabling cataract (Apple et al. 2000).

The South American section of Vision 2020 initiative has determined cataract, childhood blindness, refractive error and diabetic retinopathy as target diseases for the region. The objective is to improve cataract surgical rates, detection and treatment of retinopathy of prematurity and low vision and refractive services (Pizzarello et al. 2004).

Cataract

Cataract – an opacity in the normally clear, crystalline lens of the eye – is a major cause of blindness worldwide. Recent estimates suggest that 18 million people (48% of all cases) are blind from cataract (Resnikoff et al. 2004). The prevalence of cataract also increases with age in developing countries (Brian and Taylor 2001). Many risk factors are associated with the onset and the progression of cataract: metabolic diseases (diabetes), chronic UV-B light exposure, medications (steroids), smoking and genetics (West 2007). Since cataract can be removed by with an easy, safe and cost-effective surgical procedure, this condition is a potentially curable form of blindness. The challenge to deal with this curable cause of blindness is to provide available high-volume, low-cost, safe and high-quality surgery with affordable intra-ocular lenses in appropriate eye health care centers.

A compilation of previous studies of adults of 50 years of age and older in Latin America focused on evaluating blindness due to cataract using a simplified ophthalmic exam described in the Rapid Assessment of Cataract Surgical Services (RACSS) protocol has identified cataract as a main cause of blindness, ranging from 41% in urban Brazil to 87% in rural Peru (Limburg et al. 2008).

Data from population-based studies on surgical follow-up are essential for the assessment of the procedure quality and its final visual acuity outcomes. Evaluation of postoperative results should consider good presenting visual acuity, low rate of complications and good quality of life related to vision, so that activities such as driving, reading, sewing, interpersonal interactions, and computer skills can be restored.

Prevention of cataract blindness can be pursued by avoidance of known risk factors, as well as education programs to encourage those at risk of blindness to obtain comprehensive ophthalmologic examination on a regular basis. Other cultural aspects have also to be addressed. Acceptance of impaired sight as an inevitable consequence of old age, fear of the operation, contact with individuals who have had bad experiences, lack of encouragement from the family, lack of knowledge concerning where surgery is provided, distance from the service, lack of a person to accompany the patient to the hospital, poor state of hospitals, long waiting lists, and cost are the main barriers to the uptake of cataract services (Hubley and Gilbert 2006).

Refractive error

Refractive errors (myopia, hyperopia and astigmatism) affect a large proportion of the population worldwide, irrespective of age, sex and ethnic group. They can be easily diagnosed, measured and corrected with spectacles or other refractive corrections to attain normal vision. If, however, they are not corrected or the correction is inadequate, refractive errors become a major cause of low vision and even blindness. Visual impairment from uncorrected refractive errors can have immediate and long-term consequences in children and adults, such as lost educational and employment opportunities, lost economic gain for individuals, families and societies, and impaired quality of life. Various factors are responsible for refractive errors remaining uncorrected: lack of awareness and recognition of the problem at personal and family level, as well as at community and public health level; non-availability of and/or inability to afford refractive services for testing; insufficient provision of affordable corrective lenses; and cultural disincentives to compliance (Resnikoff et al. 2008).

Refractive error as a cause of blindness has not received much attention because many definitions of blindness have been based on best-corrected distance visual acuity, including the definition used in the International Statistical Classification of Diseases and Related Health Problems – ICD-10 (Dandona and Dandona 2006). A major limitation of ICD-10 categories is that they do not allow refractive errors to be assessed as cause of visual impairment. The WHO recently suggested that "presenting visual acuity" (i.e. visual acuity obtained with currently available refractive correction, if any), as well as uncorrected visual acuity, be used in all population-based surveys. Thus, presenting vision as opposed to best-corrected vision provides the prevalence of visual impairment that could be improved simply by appropriate corrective refraction (Resnikoff et al. 2008, Gilbert et al. 2008).

A recent compilation of surveys performed in several regions of the world showed an estimated 153 million people to be visually impaired from uncorrected refractive errors, of whom eight million are blind (Resnikoff et al. 2008). Actions to prevent blindness and visual impairment due to refractive errors include implementation of large scale vision screening programs, sufficient personnel to perform quality refraction and provision of affordable quality spectacles (Dandona and Dandona 2001).

Age-related Macular Degeneration (AMD)

Age-related macular degeneration (AMD) is a disorder of the macular area of the retina, most often clinically apparent after 50 years of age, characterized by discrete whitish-yellow spots identified as "drusen" which are external to the neuroretina or the retinal pigmented epithelium (RPE) and may be soft or hard. The disciform variant of this disorder was first labeled senile macular degeneration. In the most severe forms of AMD, either the RPE may atrophy completely (geographic atrophy or "dry AMD"), or growth of new vessels and leakage can occur (exsudative or "wet AMD"), with possible detachment of the RPE and retina as well (West 2000). There is currently no effective treatment that will prevent AMD or restore vision once it has been lost. Thus, research into the pathogenesis and treatment of this disease should have a high priority.

AMD causes difficulty with tasks requiring central vision, such as reading, writing, driving and recognizing faces, and is a leading cause of legal blindness in the older population in industrialized countries (Klein et al. 2002, Taylor et al. 2005). This very high rate will lead to an increasing importance of AMD as the population ages and the number of elderly people increases (VanNewkirk et al. 2000).

Risk factors for AMD are increasing age, smoking, family history, Caucasian ethinicity among others (Wang et al. 1998). On the other hand, persons with higher education were at lower risk for AMD (Age-Related Eye Diseases Study Research Group 2000). Pooled data to assess the prevalence and potential risk factors for late AMD in three racially similar populations from North America, Europe, and Australia provide strong and consistent evidence that tobacco smoking is the principal known preventable exposure associated with any form of AMD. The findings support further health advocacy approaches to reduce the tobacco smoking rate, and also support research to identify possible candidate genes that may predispose to AMD (Smith et al. 2001).

Many modalities have been tested for the treatment of neovascular AMD. Antioxidant supplements were tested for prevention and to slow the progression of the disease with some benefit for slowing vision loss and no preventive effects (Evans 2008). Other types of treatment have been used for neovascular (exsudative) AMD: photodynamic therapy with verteporfin, intravitreal triamcinolone, antivascular endothelial growth factor (VEGF) agents, such as pegaptanib and, to a greater extent, ranibizumab and bevacizumab. Recent reports on the subject suggest that most of these treatments improve visual acuity of AMD patients, but these are still short-term results and more research about these new therapies need to be done (Schmidt-Erfurth and Pruente 2007).

Diabetic Retinopathy (DR)

Diabetes mellitus is an important public health problem affecting nearly 200 million people worldwide. Diabetic retinopathy (DR), a specific microvascular complication of diabetes, is a major cause of blindness. The prevalence of DR increases with duration of diabetes, and nearly all persons with type 1 diabetes and more than 60% of those with type 2 have some retinopathy after 20 years (Klein et al. 1998).

The disease can be classified into 2 stages: nonproliferative and proliferative. In nonproliferative DR, the earliest visible signs are microaneurysms and retinal hemorrhages. Progressive capillary nonperfusion is accompanied by the development of cotton-wool spots, venous beading, and intraretinal microvascular abnormalities. Proliferative DR is characterized by the growth of new blood vessels on the surface of the retina or the optic disc. These abnormal vessels may bleed, resulting in vitreous hemorrhage, subsequent fibrosis, and tractional retinal detachment. Diabetic macular edema (DME), which can occur at any stage of DR, is characterized by increased vascular permeability and the deposition of hard exudates at the central retina. Primary interventions, such as intensive glycemic and blood pressure control, can reduce the incidence of DR, while secondary interventions, such as laser photocoagulation, may prevent further progression of DR and vision loss (Mohamed et al. 2007).

Identified risk factors for DR are: duration of diabetes, hyperglycemia/glycated hemoglobin value, hypertension, hyperlipidemia, pregnancy, nephropathy/renal disease, obesity, smoking, moderate alcohol consumption and physical inactivity (Klein et al. 1998, van Leiden et al. 2003, Mohamed et al. 2007).

It is estimated that, in 2002, DR accounted for about 5% of world blindness, representing almost 5 million blind. As the incidence of diabetes gradually increases, there is the possibility that more individuals will suffer from eye complications which, if not properly managed, may lead to permanent eye damage. The control of glycemia decreases the risk of the incidence and the progression of the retinopathy. If sight threatening retinopathy is present, timely laser photocoagulation of the retina decreases the risk of a subsequent severe visual lesion (WHO 2008).

Glaucoma

In the public health context, glaucoma is an irreversible optic neuropathy associated with characteristic cupping of the optic nerve head with corresponding nerve fiber loss and peripheral and ultimately central visual field defects (Wolfs et al. 2000, Foster et al. 2002, Congdon et al. 2003). Glaucoma can be classified into angle closure and open angle types. Open angle glaucoma (OAG) is defined as a condition of an intraocular pressure, arbitrarily set at > 21 mmHg, that causes glaucomatous damage of the optic disc and field loss (West 2000). An estimated 6.7 million people are blind from glaucoma worldwide, with almost 70 million affected by the disease (Congdon et al. 2003).

Although standardization of diagnostic methods, including intraocular pressure, cup disc ratio, visual field testing, and inclusion of gonioscopy is required, the primary risk factor for OAG is elevated intraocular pressure (West 2000). Recent clinical trials indicate that lowering the intraocular pressure can prevent the development of glaucoma in individuals with elevated intraocular pressure, and can decrease the likelihood of progression in those with early disease (Congdon et al. 2003). The prevalence of glaucoma clearly rises with age (Wensor et al. 1998, Wolfs et al. 2000). Risk factors among siblings are age, IOP, myopia, and low blood pressure – IOP differences (Leske et al. 2001). Also, female gender and family history of glaucoma increases the risk of OAG.

Ethnic differences in the prevalence of the various types of glaucoma are marked (Leske 2007). Data from LALES show that Latinos with a predominantly Mexican ancestry in Los Angeles have rates of open-angle glaucoma (OAG) comparable to those of US blacks, and significantly higher than those seen in non-Hispanic whites. According to this study, the high rate of undiagnosed OAG in Latinos suggests that the role of early screening, diagnosis, and management should be further examined (Varma et al. 2004).

Glaucoma accounts for 10–20% of all blindness in many countries. In industrialized nations for people over 40 years of age, its prevalence is 1.5–2% and, in African populations, it is at least 2–3 times this figure (Apple et al. 2000). Glaucoma is an increasing problem, for which treatment is effective if initiated early in the disease and if suitable specialist ophthalmic services are available. About current utilization of eye care services, blacks account for 6.0% of all cataract visits and 13.6% of all the glaucoma visits. Substantial racial differences also exist in annual rates of ambulatory visits for both cataract and glaucoma among those aged 65 and over (Javitt 1995).

The management of this condition involves explaining a complex health problem and the need to adhere to a regime of self administered eye drops, or to accept surgery. Improvements should address locally identified barriers, which might include quality of clinical care, as well as all the other non-clinical aspects of care. There is a need to improve the quality of information provided to patients to promote adherence to treatment regimes and follow up, to increase awareness of possible side effects and action needed to prevent recurrence (Hubley and Gilbert 2006).

Population-Based Studies in Brazil

Between 2003 and 2005, two population-based surveys of prevalence and causes of visual impairment and blindness were conducted in an urban low-middle income area of São Paulo, Brazil: the São Paulo Eye Study (Salomão et al. 2008) and the Refractive Error in School-Children – RESC (Salomão et al. 2008). These two surveys used similar methods previously used in studies performed in other developing countries such as Nepal (Pokharel et al. 1998, 2000, Sapkota et al. 2008), China (Zhao et al. 1998, 2000, Li et al. 1999, Michon et al. 2002, He et al. 2004, 2007); Chile (Maul et al. 2000); India (Murthy et al. 2001, 2002, Nirmalan et al. 2002, Dandona et al. 2002); South Africa (Naidoo et al. 2003) and Malaysia (Goh et al. 2005).

Prevalence and causes of visual impairment and blindness in older adults in Brazil

The São Paulo Eye Study (SPES) was a population-based study of urban, low-middle income residents of three districts of São Paulo city (Ermelino Matarazzo, Vila Jacuí and São Miguel) aged 50 years or older. Detailed methods have been published previously (Salomão et al. 2008). Briefly, 3768 participants were recruited from 22 randomly selected clusters. A door-to-door household census was conducted to identify residents who had lived in their homes for at least 6 months and were aged 50 years and older. The study was carried out from July 2004 to December 2005. The Committee on Ethics on Research of UNIFESP approved the implementation of the survey protocol. Human subject research approval of the original protocol was cleared by the World Health Organization Secretariat Committee on Research Involving Human Subjects.

Within each cluster, enumerated persons were invited to the clinical examination station at the nearby hospital on a mutually agreed upon date. Written informed consent was obtained at the examination station using a scripted consent form. The examination included presenting visual acuity (which was measured with participant's spectacles, if usually worn), ophthalmic examination of the eyelid, globe, pupillary reflex, lens and measurement of intra-ocular pressure (IOP). Best-corrected visual acuity was measured for those with visual acuity 20/40 or worse, and for those previously operated for cataract.

For our analysis, all participants were classified according to the vision in their better eye. Visual impairment was defined as presenting visual acuity 20/40 or worse in the better eye. It was attributable to refractive error if best-corrected visual acuity was 20/32 or better, and to another cause if best-corrected vision remained 20/40 or worse. Blindness was defined as presenting visual acuity worse than 20/200 in the better eye and was attributable to refractive error if best-corrected visual acuity was 20/32 or better. Cases of vision impairment not caused by refractive error were attributed to the disease considered as a principal cause if more than one disease occurred in the eye.

Data were available for a total of 3678 participants, with participation rate of 87%. The prevalence of visual impairment ($< 20/63$ to $\geq 20/200$) in the better eye was 4.74% (95% CI: 3.97%–5.53%), and 2.00% (95% CI: 1.52%–2.49%) with best correction. The prevalence of presenting bilateral blindness ($< 20/200$) was 1.51% (95% CI: 1.20%–1.82%), and 1.07% (95% CI: 0.79%–1.35%) with best-correction. Extrapolating these figures to the general population of adults aged 50 years or older in the country, there were 1,120,000 Brazilians with uncorrected or uncorrectable visual impairment, including 357,000 Brazilians with uncorrected or uncorrectable blindness. Blindness was shown to be associated not only with older age, as expected, but also with the lack of formal education.

Retinal disorders (including diabetic retinopathy, macular degeneration, retinal detachment, and other retinal causes) were the main cause of blindness, followed by cataract and glaucoma. One explanation for the relatively high ranking of retinal disorders as a cause of blindness is the success of the Brazilian initiative to improve access to cataract surgical services. With a more than tripling of the annual number of cataract surgeries over the past 5-year period, cataract blindness is likely to have been significantly reduced and, therefore, blindness due to other ocular diseases/conditions is becoming more prominent.

Overall, 32% of visual impairment and 6% of presenting blindness was caused by correctable refractive error, either myopia or hyperopia. In going beyond the protocol used in the Nepal, China, and India surveys, this study explicitly included visual acuity $< 20/32$ to $\geq 20/63$ as a category of reduced vision (labeled near-normal vision) Including this mild impairment, this category was considered important in densely populated urban areas such as São Paulo, where visual requirements for driving and work purposes may be more demanding. Our finding of uncorrected refractive error as the primary cause of mild visual impairment is unmistakable.

The prevalence of visual impairment and blindness based on best-corrected visual acuity puts São Paulo in a position somewhat similar to that in the United States, where the prevalence of best-corrected visual acuity of $< 20/40$ to $> 20/200$ in the better seeing eye was reported as 1.98% among those 40 years of age, and the prevalence of blindness $\leq 20/200$ as 0.78% (Congdon et al. 2004).

Because Brazil covers large territory with many socioeconomic and regional discrepancies, additional surveys including rural areas with poor access to eye care are needed to provide more widely representative estimates of visual impairment and blindness in Brazil.

Prevalence and causes of visual impairment in school children in Brazil

Clinical evidence suggests that refractive error (RE), including amblyopia and strabismus, are common ophthalmic disorders in children. However, despite the recognized importance of correcting refractive anomalies in children, there are few reliable studies on the type and prevalence of the various anomalies encountered. RE, and particularly myopia, places a substantial burden on the individual and on society. Myopia can have a potential negative impact on career choice, ocular health, and sometimes self-esteem. School-age children constitute a particularly vulnerable group, in which uncorrected RE may have a dramatic impact on learning capability and educational potential. Data on RE prevalence and the utilization of corrective spectacles among school-age children are needed for eye health care planning.

In addressing the widespread need for population-based data on childhood refractive error, the Refractive Error Study in Children (RESC) protocol to assess the prevalence of visual impairment and refractive error in children of different ethnic origins and cultural settings using consistent definitions and methods was developed (Negrel et al. 2000).

Previous RESC surveys showed that visual impairment, because of refractive error, was uncommon among children not attending school (Pokharel et al. 2000, Dandona et al. 2002, Naidoo et al. 2003). On the basis of these findings, a subsequent RESC survey in rural Yangxi, China was designed using logistically less cumbersome school-based sampling (He et al. 2007). Further, because of resistance among parents in providing consent for cycloplegia, on a recent survey among private secondary schools in Kathmandu, Nepal, only children with visual impairment were evaluated with cycloplegic refraction (Sapkota et al. 2008). The current emphasis in RESC surveys is, thus, not on evaluating the prevalence of refractive errors, but on visual impairment with refractive error.

The RESC study in Brazil was a population-based survey using school-based sampling of low-middle income school age children from nine randomly chosen public schools in the districts of Ermelino Matarazzo, Vila Jacuí and São Miguel in São Paulo city. A full methodological description has been provided elsewhere (Salomão et al. 2008). A random sample of 2825 children ages 11–14 years registered in grades 5–8 were invited for a clinical ophthalmologic examination performed in the school. The study was carried out from June to November 2005. The Committee on Ethics on Research of UNIFESP approved the implementation of the survey protocol. Human subject research approval of the original protocol was cleared by the World Health Organization Secretariat Committee on Research Involving Human Subjects.

School authorities contacted the parents/guardian of each child to obtain informed consent. The examination included uncorrected and presenting visual acuity (which was measured with participant's spectacles, if usually worn), ocular motility, external eye and anterior segment (eyelid, conjunctiva, cornea, iris, and pupil). Subjective cycloplegic refraction was performed in children with unaided (uncorrected) visual acuity of 20/40 or worse in either eye. A principal cause for eyes with uncorrected visual acuity 20/40 or worse was assigned. Refractive error was assigned routinely if acuity improved to at least 20/32 with refractive correction. Children with visual impairment that improved with refraction were prescribed and provided free spectacles, as well as local medical advice for minor disorders. Children needing tertiary medical treatment were referred to the eye clinic at the local UNIFESP unities of Ermelino Matarazzo Hospital or São Paulo Hospital.

A total of 2,441 children were examined, representing an examination response rate of 86.4%. The prevalence of uncorrected, presenting, and best-corrected visual acuity 20/40 or worse in the better eye was 4.82%, 2.67%, and 0.41%, respectively. The prevalence of visual impairment with myopia and visual impairment with hyperopia, was 5.46% and 2.05% respectively. Refractive error was a cause in 76.8% of children with visual impairment in one or both eyes; amblyopia, 11.4%; retinal disorders, 5.9%; other causes, 2.7%, and unexplained causes, 7.7%. For those who could benefit from adequate glasses, 51.9% were without the necessary correction.

Considering that a significant number of children are without appropriate refractive correction, the relatively low prevalence of visual impairment with myopia or hyperopia should not be taken to suggest that refractive errors are an insignificant contributor to visual disability in Brazil. Because visual impairment can have a detrimental impact on social and educational development in a child's life, exploration of cost-effective strategies to eliminate this easily treatable cause of visual impairment are warranted.

CONCLUSIONS

Epidemiological data from two recent population-based studies in Brazil have brought important contribution for health authorities to planning and implement eye care services. Retinal disorders in older adults and uncorrected refractive errors in both older adults and school children are target diseases. Actions to maintain the access to modern cataract surgery and provision of good quality affordable glasses are desirable and should be sustainable. Retinal diseases are emerging as principal cause of unavoidable blindness in older adults from urban Brazilian areas, and strategies to address this important issue are extremely different from those implemented against cataract blindness. Early diagnosis and adequate therapy for retinal disorders require specific technology, as well as long-term and permanent care. Since Brazil is a country with regional and socio-economic disparities, studies in rural and less privileged areas in the country are needed for a thorough picture of the magnitude and causes of visual impairment and blindness.

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RESUMO

Nosso objetivo é fazer uma revisão de cegueira e deficiência visual no contexto de recentes estudos epidemiológicos oculares brasileiros. É apresentada a síntese dos dados de dois estudos populacionais transversais – o Estudo Ocular de São Paulo e o Estudo de Erros Refrativos em Escolares. Entre julho de 2004 e dezembro de 2005 foram examinados 3678 adultos e 2441 escolares. A prevalência de cegueira em adultos mais velhos considerando a acuidade visual apresentada foi de 1,51% diminuindo para 1,07% com a correção refrativa. As causas mais comuns de cegueira em adultos mais velhos foram os distúrbios de retina, seguidos de catarata e glaucoma. Em escolares a prevalência de deficiência visual não corrigida foi de 4,82% diminuindo para 0,41% com a correção refrativa. Em escolares a causa mais comum de deficiência visual foram erros refrativos não corrigidos. A deficiência visual e a cegueira são um importante problema de saúde pública no Brasil. É um problema significante em brasileiros mais velhos reforçando a necessidade de implementação de programas de prevenção de cegueira para pessoas idosas com ênfase nos indivíduos sem escolaridade. Em escolares são necessárias estratégias de custo-eficácia para atingir uma causa de deficiência visual facilmente tratável – a prescrição e a provisão de óculos.

Palavras-chave: cegueira, deficiência visual, prevalência, estudo populacional, epidemiologia ocular.

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