Amblyopia and strabismus screening program, Mexico 2016

Campaña de detección de ambliopía y estrabismo. México 2016

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Abstract

Introduction: Based on the levels of visual disability reported by the World Health Organization, has been prepared the National Campaign for Amblyopia and Strabismus in Mexico, with the Mexican Center of Strabismus, the Mexican Society of Ophthalmology, and the Mexican Council of Ophthalmology, with the objective of establishing a screening program in amblyopia in the general population. Methods: A public screening program was designed in 4 phases, from the program and organization of sites, a preparatory course, to the analysis of results, from May 2016 to January 2017. Results: Ninety sites were organized in Mexico, 1028 people were studied, aged 17.4 ± 19 years, and 727 were children aged 6.7 ± 3 years. Several alerts were obtained which demonstrate the problematic and the requirements of public health. Conclusions: The high levels of visual disability in the world population require better strategies, as demonstrated by the National Campaign for Amblyopia in Mexico. It has to be considered a permanent information to the public, facilitating access to the first-level medical service; promoting early care of vulnerable groups; medical actualization; communication with health leaders that generates cost-effective strategies for early detection and treatment, and controlled by laws that results in the reduction of visual disability. Fourteen Ibero-American countries joined the campaign because finally the causes of amblyopia are the same, the lack of information is repeated, and the numbers of disability increase.


Resumen

Introducción: En base a los niveles de discapacidad visual reportados por la Organización Mundial de la Salud, se realizó la Campaña Nacional de Ambliopía y Estrabismo en México, propuesta a través del Centro Mexicano de Estrabismo, la Sociedad Mexicana de Oftalmología y el Consejo Mexicano de Oftalmología, con el objetivo de establecer un programa de detección en ambliopía en la población general. Método: Se estableció un programa de detección gratuita diseñado en 4 fases, desde el programa y organización de sedes, curso preparatorio, hasta el análisis de resultados, de mayo de 2016 a enero de 2017. Resultados: Se organizaron 90 sedes en México. Fueron exploradas 1,028 personas, con edad de 17.4 ± 19 años, de los cuales 727 fueron niños con edad de 6.7 ± 3 años. Se obtuvieron diversas alertas que demuestran la problemática y los requerimientos de salud pública. Conclusiones: Los altos niveles de discapacidad visual en la población mundial obligan a establecer mejores estrategias, como lo demuestra la Campaña Nacional de Ambliopía en México. Debe considerarse mantener información permanente a la población, facilitar el acceso al servicio médico de primer nivel de atención, favorecer la atención temprana de los grupos vulnerables, actualización médica continua y una permanente...
Introduction

The World Health Organization has reported that in 2010 the estimated number of people with visual impairment worldwide was 285 million, 42% of which due to uncorrected refractive errors and 33% due to cataracts. The World Health Organization suggests and considers that all countries perform cost-effective interventions to reduce both causes. It is evident that in the Ibero-American countries the levels of visual disability represent a major public health problem, since of the 26.6 million people with visual impairment in Latin America in 2010, 3.2 million were blind, so permanent strategies should be implemented to reduce these figures.

Current amblyopia definition

Uncorrected refractive errors are considered the first cause of visual disability in the world. The degree of alteration is variable since it can occur as a visual defect that only requires the treatment of the refractive error or involve the presence of amblyopia in which visual maturation is interrupted and damaged, with subsequent alterations in various brain functions. To the refractive defects as causes of amblyopia, we must add other possibilities of early visual damage such as nystagmus, strabismus, and all the early organic lesions such as palpebral ptosis, leukomas, congenital cataract, retinal and optic nerve anomalies, and congenital ocular malformations.

The ocular damage that results in amblyopia should be understood as an alteration of cerebral circuits with an excitatory–inhibitory biochemical imbalance, with morphological structural changes of the neural network. This does not only imply visual affectations if we know that each neuron reaches between 5000 and 50,000 synapses participating in multiple functions including vision but also this explains why the biochemical alteration of these synapses ends up affecting other brain functions and the development of the person is hampered. This way, the concept of amblyopia should be understood as a defect in visual development, especially affecting binocularity and visual capacity, which can occur monocularly or bilaterally, with specific conditions depending on the cause: strabismus, organic injury, or ametropic defect. Within these causes, childhood strabismus, which comprises all ocular deviations that prevent binocularity, will result in the persistence of amblyopic defects when its management is only focused on esthetics and not on visual rehabilitation. Therefore, the treatment of amblyopia should always aim at favoring the visual and binocular development of the person and thereby improve other brain functions affected, especially in the areas of visual motor skills, intelligence, and attention. Early diagnosis and treatment are very important, this is, in the first years of life, and involves the use of glasses, patches, and medications such as cyclopentolate, atropine and neuromodulators, neuronal blockers, and eye surgeries, for which the ophthalmologist must be trained.

The incidence figures for amblyopia are highly variable and have been reported in up to 9% of the population, depending on the search and diagnosis criteria.

Added to the inherent problems of the disabled individual is the effect on the family’s economic situation since academic and job opportunities for people with visual disabilities in Mexico are poor. Furthermore, visually disabled people represent a risk factor to the rest of the population because they perform activities such as driving, piloting, and operating machines, and due to this, the number of legally blind people may increase due to the risk of losing the only eye with better vision.

The National Institute of Statistics and Geography shows, based on the National Survey of Demographic Dynamics, 2014, that, of the figures of disability in Mexico, the visual one occupies a second place of 58.4%, affecting children from 0 to 14 years in 26.9%, and people from 15 to 29 years in 44.6%, even with the use of glasses. It has been shown that 52.7% of people with disabilities are affiliated to a social security institution; however, 11 of 1000 people decide not to attend health services. That is why we consider that one of the problems that allows the persistence of the figures of visual disability is the lack of information to the population, as well as identifying the difficulties for access
to health services. The diagnosis and detection of amblyopia are difficult due to the lack of national programs aimed at the visual examination of children, so it was decided to establish a promotional campaign aimed at amblyopia, to stimulate awareness in different sectors of the population.

**Purpose**

The National Amblyopia and Strabismus Campaign was carried out, proposed through the Centro Mexicano de Estrabismo, Sociedad Mexicana de Oftalmología (SMO), and Consejo Mexicano de Oftalmología, with the main objective of establishing an information and detection program, on demand, about amblyopia based on the reported figures of visual impairment in Mexico. The secondary objectives were bringing visual health services to the general population and updating the information to the medical population about this condition.

**Materials and methods**

A work schedule was structured for a promotion campaign on amblyopia detection in Mexico, from May 1, 2016 to January 3, 2017, in two stages; a first stage of construction that covered from phase 1 to 3, and a second stage of service promotion and attention performed at phase 4.

In stage 1, the structures and training for care sites were established through the following phases:

Project, Phase 1 (May 1-15): establishment of the schedule and central day (October 12), authorization processes, valuation and registration of the preparatory course, and campaign work before the SMO and Consejo Mexicano de Oftalmología.

Structuring of sites and promotion, Phase 2 (May 15-September 15): information and invitation to the presidents of the associations affiliated to the SMO on the dates of promotion and notices, preparatory course and detection date, as well as the organization of the sites. The design of the information stationery, study monographs, clinical files, campaign prescriptions, logos design, banners, flyers, posters, work schedules, and memory of 60 images on current diagnosis and treatment were performed, specifying that amblyopia diagnosis would be made even with glasses use, and the different causes of it such as strabismus, refractive defects, nystagmus, and organic injuries; and video editing for advertising on social networks contributed by the site of San Luis Río Colorado.

Distribution of the material: The sites were organized through a representative, an ophthalmologist, active registered member of the SMO; record of official address in an institutional or private office, equipped for a complete ophthalmological examination. Access to the sites by the population was established through a screening filter for the selection of patients with visual disabilities focused on amblyopia and its different causes such as strabismus, nystagmus, refractive errors, or corresponding organic defects.

Campaign resources: human personnel for the first screening filter, elaboration of clinical histories, exploration and diagnostic decision, and delivery of results.

Material resources: stationary corresponding to the campaign, computer equipment, and complete ophthalmological unit.

Campaign activities, Phase 3: completion of the visual disability workshop course.

Objective of the workshop: training ophthalmologists on amblyopia, its causes, and current treatment. Aimed at ophthalmologists. Site: auditorium of the SMO. Date: October 7, 2016. Time: 8:17:00 h. At the end of the workshop, the MD will be updated and trained on amblyopia detection and its treatment and will have a diploma endorsed by the Consejo Mexicano de Oftalmología.

Promotion service, stage 2: sites and their requirements were registered, and final dates of attention to the population were established.

Phase 4 (September 15-November 2): people received free access to the program, with a schedule established by each individual site; they were selected with the pre-determined filters, registered with the data authorized by the patient for medical care, and an ophthalmologic examination was performed. Data collection was performed for descriptive analysis, evaluation and analysis of results, impact evaluation, and continuity analysis, monitoring of treatment in the different sites (November 3-January 3).

**Results**

**Results of stage 1**

In the National Campaign for Amblyopia and Strabismus in Mexico, 90 sites were integrated throughout the country, involving 31 states (only Nayarit did not participate) and 300 professionals (Fig. 1).

A preparatory course was carried out, “Preventable Visual Disability, Adding Efforts,” in which specific issues causing amblyopia were included, the difficulties of the
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It was suggested that the course and the campaign were focused on visual rehabilitation, early diagnosis in children, preventing the persistence of amblyopia, and the current subject of brain plasticity in adults was integrated to encourage treatment at any stage of life. The following concepts were reinforced: “Mandatory early review in children,” “Glasses and patch go first,” and “No more children with amblyopia or strabismus.”

The central campaign day was on October 12, and it was performed in a variable manner by each site for up to 45 campaign days of free evaluation for the population.

**Results of stage 2**

The different sites established their local work standards; the first one started in San Luis Rio Colorado, where they implemented a “Wednesday citizen day” 1 month before the campaign, including negotiations with the government authorities, the National System for the Integral Development of the Family and information on radio and television, also at the sites in Tlaxcala, Tijuana, Veracruz, and Chiapas; other sites

<table>
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<tr>
<th>State</th>
<th>Number of sites</th>
<th>Professionals</th>
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Figure 1. Site listing by State.
prolonged the campaign for several weeks, such as in Chiapas and Pénjamo. Both private and public hospitals participated; the sites were operated by medical personnel, ophthalmologists from all subspecialities, graduates in optometry, nurses, and technicians. Once the campaign was completed at each site, the local registration was made, images with the results, proposals, and observations, and highlights were published.

Altogether, 1,028 people were examined, resulting in an average age of 17.4 ± 19 years, of which 727 were children aged 6.7 ± 3 years. The age ranges were from 1 month of age to the ninth decade of life. In most of the sites, late childhood ages predominated with a mode of 6 years of age; however, in some sites such as Puerto Vallarta, Estado of Mexico, and Sinaloa, an average age of children under 4 years of age was reported (Figs. 2-4).

The variety of diagnoses was evident and gave us a clear sample of the risks of visual impairment, both congenital and acquired, affecting all decades of life.

**Warnings obtained from the campaign**

These warnings were collected based on the medical observations at each site.

- The need to inform pediatricians, general practitioners, and family doctors about the disease for timely referral.
- Information to the population about visual health, warning about the risks in children and vulnerable groups.
- The need to update ophthalmologists about amblyopia and visual disability.
- The lack of timely detection of ocular congenital diseases such as anterior segment malformations, congenital cataracts, and congenital glaucoma.
- The lack of fundus examination in children.
- The delay in the rehabilitation of adults with paralytic strabismus.
- The persistence of amblyopia in adolescents with the premise that children over 8 years of age can no longer receive treatment.
- The high number of amblyopic patients as a consequence of receiving only motor correction for their strabismus.
- The alarming number of children and adolescents with uncorrected hypermetropic astigmatism and myopia.
- Persistent severe amblyopia figures with a visual acuity of “counting fingers” or 2 logMAR in the general population.
- Instructions on the vaccination card indicating the appropriate age for an early ocular diagnosis, the dates of visual surveillance, as well as the level of preparation and instrumentation with which the ophthalmological examination should be performed.
- The lack of information on visual risks in prematurely born children.
- The lack of training for the treatment of people with delayed psychomotor development.
- The lack of training for the diagnosis and treatment of vulnerable groups, such as people with neurological and systemic diseases that affect the visual pathway, multiple sclerosis, Parkinson’s disease, amyotrophic lateral sclerosis, ischemic stroke, cerebral infarction, brain tumors, epilepsy, and lysosomal diseases.
- The lack of information on dyschromatopsia detection.
- The lack of information on infectious diseases that affect vision, such as toxoplasmosis, toxocariasis, cysticercosis, and Zika sequelae.
- The lack of updating on the treatment of congenital nystagmus and acquired nystagmus.

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**Figure 3.** A number of children examined by age.

**Figure 4.** Percentages by age groups in children.

- The persistence of congenital esotropia, in up to 80% of strabismus.
- The lack of communication and information about amblyopia with medical and non-medical leaders that coordinate and designate resources for health.
Discussion

Several works about national campaigns have demonstrated the need for cost-effective and permanent interventions for the early diagnosis of amblyopia, which results in the reduction of global visual disability figures.

The amblyopia promotion campaign in Mexico was implemented with the purpose of generating awareness in the general population; however, obviously for the preparation of the sites, it was necessary that the professionals also had updated information about this disorder and the alternatives of treatment, which is why it was necessary to establish two stages, one to determine the structure and capacity to address the problem, and the second stage for free examination and the population’s response to the promotion of the service. Being a pathological entity that significantly affects the world population, during the development of the first phases, 14 countries were added, and in support of this, the “Amblyopia and Strabismus Borderless Campaign; Ibero-America United,” started working in Spain, Guatemala, El Salvador, Panama, the Dominican Republic, Chile, Bolivia, Argentina, Venezuela, Cuba, Colombia, Peru, Brazil, and Ecuador.

The national campaign obtained representative figures by achieving the participation of 31 States of the Mexican Republic, with different socioeconomic strata. The results of the ages and the warnings obtained have allowed us to better understand the population needs; late ages were registered for the initiation of amblyopia treatments, around 6 years of age, and this not only hinders the response to treatment but also increases the expenses by requiring more frequent changes of glasses, more frequent medical appointments, therapies and medications that otherwise, as has been demonstrated, in the face of a diagnosis in young children and early treatment, more effective and economic results can be obtained. Regarding this, in the campaign, the group comprised of children under 4 years old was only one-third of the children examined. The figures of adolescents without refractive correction were important because it reduces their school performance; likewise, the lack of correction and persistence of amblyopia and loss of binocularity in adulthood reduces job opportunities.

The risk of losing the eye with better vision in an accident is responsible for the increase in the number of blind people in the world.

The increase of neurological diseases such as multiple sclerosis and accidents in young adults causes visual impairment so that monitoring of vulnerable groups should be established. The increase in life expectancy allows the development of chronic systemic diseases that can affect vision. The improvement in neonatal strategies has resulted in the survival of premature infants with more probabilities of visual damage. The different causes of delay in psychomotor development have a high incidence of visual anomalies. All of these explain the need for vision care of the population in each stage of life.

We consider that timely detection and monitoring of visual defects would be facilitated by ophthalmological examination of every child from birth, then mandatorily at the 4th week of life in all premature children; after 4 months of age in all children or before, if there are warning ocular signs, then establishing an adequate monitoring during child development that should include ophthalmological examination 1-2 times a year, depending on ocular health, and perform extraordinary examinations for any visual problem, accidents, eye traumas, development of systemic or neurological diseases that affect vision, and even in the absence of signs or symptoms in patients from vulnerable groups.

Conclusions

The high levels of visual disability in the world population force to establish strategies that address the different problems, and within them, as demonstrated by the National Amblyopia Campaign in Mexico, the need for an early diagnosis of amblyopia and all of its causes. These detection programs allow us to identify the threats to health and the opportunities that can be applied for their reduction, within which it should be considered to
Ethical responsibilities

Protection of human or animal subjects. The authors declare that no experiments have been conducted in humans or animals for this research.

Data confidentiality. The authors declare that no patient data appear in this article.

Privacy rights and informed consent. The authors declare that no patient data appear in this article.

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Conflicts of interest

The authors declare no conflicts of interest.

References