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Blindness prevention through programs of community ophthalmology in developing countries

Prévention de la cécité grâce aux programmes de l'association d'ophtalmologie dans les pays en voie de développement

Prevención de la ceguera a través de programas de oftalmología en la comunidad en los países en vías de desarrollo

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In developing countries, where blindness is excessive, ophthalmic services must be viewed as a component of basic health services. Where the infrastructure for delivery of basic health services exists it is important to integrate primary eye care into that system. Where no infrastructure exists, the development of an infrastructure to deliver primary eye care may have a catalyzing, if not facilitating, effect on its 'system' health services. The role of the primary care health worker is pivotal given the fact that 75 – 85% of the population does not have access to the hospitals located in the urban areas (Bourne, 1977).

The major causes of blindness in developing countries are trachoma, xerophthalmia, onchocerciasis and cataract. Although different etiologies exist for each of these diseases, a universal approach, namely community ophthalmology is an appropriate strategy for blindness prevention. *Community ophthalmology* is defined as the discipline of blindness prevention utilizing the methodologies of public health, community medicine and clinical ophthalmology (Bath, 1976). A consideration of each of the 4 major causes of blindness will demonstrate the appropriateness of this concept.

Trachoma is reported to be the leading cause of blindness in the world and has a worldwide incidence of 500 million people (WHO, 1973). Trachoma is estimated to have caused blindness in upwards of 2 million people. Trachoma is a communicable ocular disease caused by infection of the eye with the TRIC agent Chlamydia trachomatis. The disease begins with a follicular conjunctivitis, and when untreated, progresses to involve the superior cornea with a fibrovascular pannus. Once established, the trachomatus pannus may progress to involve the entire cornea with subsequent opacification. Visual impairment is the result of corneal scarring which is caused by inflammatory corneal pannus, tarso-conjunctival scarring, trichiasis, and cicatricial deformity of the eyelids. Typically trachoma does not establish itself without concurrent bacterial infection. It has been proposed that severe blinding hyperendemic trachoma is the result of multiple overlapping cycles of repeated chlamydial and bacterial infections (Jones, 1975). Typically, the bacterial agents are the Koch-Weeks bacillus *(Hemophilus aegyptius),* Morax Axenfeld diplobacillus or the gonococcus.

Trachoma is a disease with low infectivity but conditions of overcrowding and lack of clean water-supply enhance infectivity. In communities where poor housing, poor sanitary habits exist in association with an abundant fly population, the conditions are provided for trachoma to become endemic. Many diseases owe their causation to poor sanitary conditions both in terms of sewage disposal as well as water-supply. The example of cholera is certainly well known among epidemiologists and environmentalists. The epidemiology of trachoma and its relationship to poor sanitation is not widely appreciated. Although abundant flies, dust, and hot arid climate are contributory to the causation of trachoma, the most important factor is

that of personal hygiene. Endemic trachoma does not occur where there is ample availability of clean running water and environmentally satisfactory mechanisms of waste disposal.

Xerophthalmia is the second major cause of blindness in the world and the leading cause of blindness in childhood in developing countries (WHO/USAID, 1976). It is estimated that hundreds of thousands of new cases of blindness occur each year as a result of xerophthalmia. Although the disease has a worldwide distribution, the most severely affected areas are in Southern Asia and Northern Saharan Africa.

Xerophthalmia includes a spectrum of corneal, conjunctival and anterior segment changes resulting from vitamin A deficiency. It is frequently accentuated by generalized malnutrition, protein malnutrition, and/or diarrhea. In its most severe form, it is characterized by keratomalacia which frequently leads to perforation and/or endophthalmitis and subsequent destruction of the eyeball. In its mildest form, xerophthalmia may be manifested by subtle conjunctival or corneal xerosis, or abnormal wettability. The earliest ocular sign of hypovitaminosis A is detectable by the electroretinogram. The dark adaptation curve diminishes prior to symptomatology of night blindness or signs of xerosis. However, electroretinography testing is a highly sophisticated procedure which is not feasible for field operations. Clinically it would be manifest as poor (decreased) night vision. The careful inspection and assessment of the cornea by trained personnel is generally adequate to detect the earliest stages of xerophthalmia. Where there is evidence of xerophthalmia, the universal administration of vitamin A to each person at risk is an acceptable program of prophylaxis/treatment.

Nutrition is certainly the most fundamental, if not also the most well established, component of basic health services. Unfortunately, the interaction between general nutritional status and eye diseases has not been a distinct component of most nutritional surveillance programs. Similarly, general nutritional assessment has been lacking in the few xerophthalmia programs which have recently been founded. *It is extremely critical to bridge this gap by (a) integrating primary eye services into existing nutritional programs, and (b) developing a basic health services infrastructure as an integral part of monovalent eye programs.*

Onchocerciasis occurs endemically in West Equatorial Africa and parts of Central and South America. It has been estimated that more than 20 million people are affected and that hundreds of thousands are blind as a result of onchocerciasis.

Onchocerciasis is a vector transmitted systemic disease caused by infestation with the filiarial organism onchocerca volvulus. In Africa, it occurs south of the Sahara in a zone bounded on the north by 15° latitude and on the south 15° latitude. In 1954, the world prevalence of onchocerciasis was estimated to be 19.8 million people of whom 19 million were in Africa. Conservative estimates place the current prevalence of onchocerciasis at 30 million of whom approximately 1.5 million are blind. Significant visual impairment results in an additional 20% of all affected individuals. Hyperendemic (67%) and endemic foci exist in the Savanna area where 40–100% of the adult population are affected (UNDP, 1973; Buck, 1974). In these hyperendemic villages, the invasion of the eye is common in childhood and the progression of the disease *leads* to blindness by youth or early adulthood. Blindness is the result of the sclerosing keratitis in combination with chronic iridocyclitis and/or glaucoma. Effective measures do not exist for the treatment of ocular onchocerciasis once the keratouveitis and sclerosing pannus has become established. Severe ocular inflammation invariably results in scar tissue, structural alteration and loss of the transparency of the ocular media. Onchocerca volvulus is sensitive to chemotherapeutic agents such as diethycarbamazine and antrypol. However, because significant toxicity is associated with all of the chemotherapeutic agents, individualized treatment program combined with periodic patient assessment is mandatory. These requirements make this form of treatment unsuitable for mass populations. It is obvious that the prevention of blindness due to onchocerciasis must have its basis in environmental control. Consequently, the vector-parasite-host relationship in onchocerciasis must form the basis for programs of control. Programs of prevention must focus on the vector or parasite destruction through ecological control.

Cataract is a significant cause of blindness in the elderly in both developed and developing

countries. In developed countries, vision may be restored by simple cataract extraction. However, in developing countries, cataract remains a significant cause of blindness in the elderly because of the relative scarcity of ophthalmologists and other trained personnel. The operation of cataract extraction is adaptable to the field situation given a controlled environment such as that possible in a mobile clinic.

The methodology of blindness reduction caused by cataract would focus on cure rather than prevention. Thus far there are no known methods of prevention of the senile degenerative cataract. Community health workers would be trained to educate the elders as to the treatment of cataract. Unfortunately, many of the elders accept blindness due to cataract as a natural and unalterable consequence of old age. Aided by a community awareness education program blindness due to cataract could become significantly reduced.

In conclusion, a *community ophthalmology* strategy is proposed to effectively impact the problem of unnecessary blindness in developing countries. Important components of such a program would include: (1) Training of indigenous persons to become community health workers (CHW); (2) community screening projects to detect eye diseases at earliest possible stages; (3) health education programs to stimulate improved nutrition, personal hygiene, environmental control and thereby provide a basis for blindness prevention; (4) primary eye care provided at village level by CHW; (5) mobile surgical clinics for cataract extraction; (6) mobile teams including CHW to provide for continuity of care and follow-up mechanism.

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