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A Review on Age Related Eye Diseases and their Preventive Measures

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Abstract

Age-related eye diseases, in many cases are not sudden but tend to develop slowly as a person ages. Of the many age-related eye diseases, there are four major ones that are recognized and that can be detected and treated if a comprehensive eye examination is performed. These four age-related eye diseases are Macular Degeneration, Cataracts, Glaucoma and Diabetic Retinopathy are expected to dramatically increases if left untreated can cause serious vision loss and blindness. Populations are most at risk for developing eye disease is unaware of the factors that make them susceptible. However there are certain common preventive measures like taking Healthy Diet, avoiding Smoking and managing Health conditions.

Keywords: Age-related eye diseases; Macular Degeneration; Cataracts; Glaucoma; Diabetic Retinopathy; Healthy Diet; Health conditions

Abbreviations: (AMD): Age-related macular degeneration; (CNVM): choroid neovascular membrane; (NSAID): Non-steroidal anti-inflammatory drug; (IOP): Intraocular pressure ;(RD): Retinal detachment; (LC-PUFA): Long chain polyunsaturated fatty acids ;(LASIK): laser-assisted in situ keratomileusis;

Introduction

Age-related eye diseases are costly to treat, threaten the ability of older adults to live independently, and increase the risk for accidents and falls. To prevent vision loss and support rehabilitative services for people with low vision, it is imperative for the public health community to address the issue through surveillance, public education, and coordination of screening, examination, and treatment [1].

Ocular injuries still remain a leading cause of avoidable monocular blindness throughout the world, although epidemiology of those traumatic events is not well defined. Most ocular traumas occur in working-age people, and in this connection have a significant impact on further personal and occupational life. Medical expenses, worker's compensation and lots of productivity frequently produce big short and long term eye trauma costs [2].

Several large population based studies have provided new information on the prevalence of visual impairment and the major age related eye diseases. In particular, the epidemiology of refractive errors and glaucoma has been well characterized, providing insights not only into the public health implications of these conditions, but also into anatomical changes of the eye with ageing [3].

Certain parts of the eyes become less elastic, which impacts how well you can focus at close range. Cells may clump, causing floaters. These and other changes are a natural part of aging. Five ocular disorders, mainly affecting different parts of the eye [4].These changes are a normal part of aging alone cannot stop you from enjoying an active lifestyle or stop you from maintaining your independence.

Ageing-Related Eye problems

While many eye problems can occur at any age, they often are more common in older individuals. Unfortunately, aging also increases your risk for certain types of sight-threatening eye conditions that can lead to blindness. But as you age, you are at higher risk of developing age-related eye diseases and conditions. These include: age-related macular degeneration, cataract, diabetic eye disease, glaucoma, low vision and dry eye. To prevent this eye diseases there are certain preventive measures to be taken like multivitamins and managing health conditions.

Age-Related Macular Degeneration: Age-related macular degeneration (AMD) is the leading cause of severe visual loss in adults in the developed world. AMD affected over 1.7 million people in US alone in 2004. Owing to the rapid aging of the population, the number is expected to increase to 3 million by the year of 2020 [5].

Age-related macular degeneration is a major cause of irreversible visual loss in developed countries in 65 years and older. Although the etiology of AMD is not clearly understood, vascular irregularities and circulatory dysfunctions have been proposed in the pathogenesis of this disease. The two types of AMD are non-Exudative type and neovascular type. Neovascular AMD is characterized by choroid neovascular membrane (CNVM) that due to the formation of abnormal blood vessels, which grow from the choroid into or under the retina. CNVM is present in only 10% of patients with AMD. However, it is responsible for 90% of cases with severe vision loss from hemorrhage and fibrosis [6].

Age-related Macular Degeneration (AMD) is a disease in which choroid blood vessels grow pathologically to invade the retina [7].The past decade has brought about a dramatic upgrade in our management of neovascular age related macular degeneration (AMD). Ranibizumab, the most efficacious treatment of neovascular AMD to date, still leaves room for improvement. Furthermore, the social and budgetary burdens of repeated visits, injection fees, and pharmaceutical costs are large, and given the expanding population of AMD patients, alternative therapies with less re-treatment would be highly desirable [8]. It's important for clinicians to be aware and keep unusual sites of presentation in mind for timely diagnosis and treatment [9].

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Cataract: Cataract is a significant health care problem in all parts of the world. Untreated, cataract may develop into a blinding condition and in spite of an effective treatment it remains the most prevalent cause of blindness globally. Expectedly, the need for surgery will increase dramatically not only because of an increased proportion of elderly citizens but also because of a tendency towards surgery earlier in the disease process [10].

Cataracts are produced by opacity of the lens, so less light reaches the retina. Recent evidence suggests that dysfunction of gap junction channels and hemi channels may induce cataract formation. Cataract is a pathological condition in which the lens becomes opaque, thus reducing the amount of light reaching the retina. The causes for cataract formation are diverse, including gene mutations and posttranslational protein modification [11]. Ophthalmologists should be aware that in some congenital cataracts [12].

High myopia is known to be associated with cataract, and a relationship between myopia and cataract has been suggested. Although the deprivation of form vision due to cataracts in childhood leads to increase in axial length and myopia had been reported but if cataract may affect the axial length in adults is still unknown [13]. Cataract surgery is the most commonly performed ophthalmic operation [14]. Cataract surgery has become one of the most common and successful procedures in ophthalmology [15]. Cataract is a pathological condition in which the lens becomes opaque, thus reducing the amount of light reaching the retina. The causes for cataract formation are diverse, including gene mutations and posttranslational protein modification [16]. Inadvertent Intravitreal Gentamicin injections can cause cataracts as well as retinal toxicities [17].

Lack of awareness of rights, supportive services, and the importance of having eye examination was partially due to illiteracy and partially due to low priority at governmental levels. Awareness and availability of services alone is insufficient without having accessibility to its [18]. Insidious processes associated with aging are required to establish the conditions necessary for human cataract [19].

Cataract is the leading cause of blindness globally, except in the few most developed countries, despite improvement in the cataract surgical techniques and cost-effective intervention programs. It was estimated that 314 million people are visually impaired worldwide; 45 million of them were blind due to different causes, and 39.1% of the global blindness was due to cataract. Increasing life expectancy and low uptake of cataract surgical services in the developing countries contribute to the increased burden of untreated cataract patients [20].

To maximize the outcome of cataract surgery, post-operative treatments of uncomplicated cataract extraction include three topical pharmaceutical agents: an antimicrobial, a potent corticosteroid and a non-steroidal anti-inflammatory drug (NSAID) [21].Anti-vascular endothelial growth factor (VEGF) therapy is now a first-line treatment for age-related macular degeneration (AMD). Although the treatment is generally safe, severe side effects, (e.g., Endophthalmitis, lens injury, and retinal detachment) occasionally occur. The drug is also associated with systemic side effects, particularly thromboembolic events [22].

Glaucoma: Glaucoma is a common neurodegenerative ocular disease in which selective cell death of retinal ganglion cells results in a characteristic clinical pattern of visual field loss and excavated appearance of the optic nerve head. To date, at least 20 genetic foci have been reported although the underlying patho-physiology of glaucoma candidate genes remains to be elucidated [23]. Visual field assessments commonly used in clinical practice are subjective in nature. The test results depend on subjective responses of the patient [24].

Glaucoma is recognized as a leading cause of irreversible blindness in the developed world. It is known that elevated intraocular pressure (IOP) is the primary risk factor for glaucoma. Recently, more and more evidences show that vascular deficit also plays an important role in the pathogenesis of glaucomatous optic neuropathy. The vascular aetiology of glaucoma hypothesizes that a compromised blood supply to the optic nerve head contributes to optic nerve head damage. Color Doppler imaging (CDI) has been introduced recently to ophthalmology as a non-invasive imaging method to measure blood flow velocities of retro bulbar vessels [25].

Corticosteroid has long been recognized to raise intraocular pressure (IOP). IOP rise is related to duration of treatment, corticosteroid type and dose as well as individual susceptibility. Steroid has been shown to produce an IOP rise over a period of weeks in both normal and glaucomatous eyes. The mid-term glaucoma management in patients undergoing surgery indicated a successful outcome in final IOP and fairly good prognosis for visual function, without antiglaucoma medication. Most patients with elevated IOP after corticosteroid usage can be successfully managed with topical glaucoma medication [26].

Glaucoma is a multifactorial disease and is the second leading global cause of vision loss. With an aging population, glaucoma related problems are estimated to expand. Large numbers of patients in the ongoing Dallas Glaucoma Registry do provide adequate data to better understand risk factors, early detection, improved screening targets, treatment options, outcomes and future studies [27].Open angle glaucoma, affects at least 1.7% of the population over 40 years of age in industrial countries [28].To increase awareness and emphasize clinically relevant management issues for patients with ocular inflammation and other ocular symptoms [29].

Several new methods based on evolving technologies were introduced in the last decades to enhance and facilitate anterior segment diagnostics in glaucoma [30] .unlike most surgical procedures; success of glaucoma filtering surgery is achieved through the inhibition of wound healing. The process of wound healing is composed of 2 processes: replacement and regeneration by collagen lay-down from fibroblasts [31].

Diabetic Retinopathy: Diabetic retinopathy is a leading cause of visual loss in developed countries Diabetic retinopathy is a disease resulting from diabetic chronic hyperglycemia characterized by micro vascular complications in the retina, where neuronal elements responsible for vision are located. It is the main cause of adult blindness in developed countries. Oxidative stress has been widely regarded as the key factor for the emergence of ocular disease and has been involved in increased vascular permeability, disruption of blood-retinal barrier, apoptotic loss of retinal capillary cells, micro vascular abnormalities and retinal neovascularization. Dietary supplementation with antioxidants has been related with inhibition of diabetes-induced abnormalities of retinal metabolism, reduction of apoptosis and partial restoration of pericytes [32].

Diabetic retinopathy is a leading cause of visual loss in developed countries. Based on guidelines presented by the Early Treatment of Diabetic Retinopathy Study group (EDTRS) and the Diabetic Retinopathy Study (DRS), pan retinal photocoagulation (PRP) is an effective treatment for proliferative diabetic retinopathy (PDR) to prevent vision loss or progression of retinopathy. Thus, pan retinal photocoagulation (PRP) should be performed as the treatment of choice in proliferative diabetic retinopathy (PDR). PRP is effective in halting new vessel growth and the regression of proliferative retinopathy in most diabetic patients [33].

These patients usually present with visual loss in either one or both eyes with a superior visual field defect derived from an inferior RD retinal detachment (RD) [34] it's important for clinicians to be aware and keep unusual sites of presentation in mind for timely diagnosis and treatment [35].The surgeon to use as many methods as data is available and carefully evaluate the results [36].

Dry Eyes: Dry eye syndrome is a chronic lack of sufficient lubrication and moisture on the surface of the eye. Its consequences range from subtle but constant irritation to ocular inflammation of the anterior (front) tissues of the eye. Dry eyes also are described by the medical term, keratitis sicca, which generally means decreased quality or quantity of tears. Keratoconjunctivitis sicca refers to eye dryness affecting the cornea and conjunctiva. Dry eye is a common complication following laser-assisted in situ keratomileusis (LASIK) and punctual plug is an effective treatment by reducing tear outflow. Among the complications associated with punctual plugs is downward migration of the plug predisposing to infection. The most common pathogens in canaliculitis are Actinomyces Israeli and Nocardial species [37].

Ocular trauma frequently causes lens and iris injuries, which may include traumatic cataracts, lens dislocation or subluxation, combined with complete or partial Aniridia, or traumatic mydriasis. The loss of the iris diaphragm function leads to spherical and chromatic aberrations, glare, significant photophobia, cosmetic defect, photopic retinal damage, and low visual acuity (VA) after trauma [38].

Corneal neovascularization caused by various ocular conditions such as infectious, inflammatory, degenerative, or traumatic diseases of the cornea. Conventional treatments for corneal neovascularization, including medications such as steroids or angiogenesis inhibitors, laser photocoagulation, fine needle diathermy, and surgery, have clinical limitations and adverse effect [39].

Preventive Measures

Managing health conditions: Aging is often associated with a stage of life accompanied by illness and frailness, as well as by a variety of physiological, psychological, economic and social changes that may adversely affect nutritional status. Older people may have a higher prevalence of chronic diseases many risk factors can induce older people to an unhealthy nutritional status developing over nutrition or under nutrition. Intervention studies indicate that malnutrition is a major reason for hospitalization for the elderly. Poor nutrition and under nutrition are widespread and occur in 15 to 50 % of the elderly population but the symptoms of malnutrition (weight loss, disorientation, lightheadedness and loss of appetite) can easily erroneously lead to wrong diagnoses [40].

However, owing to numerous stabilization procedures, it has been possible to derive an array of health-promoting value-added product [41] improving health in adults and older people with low physical capacity [42].Here is a large gap in the public's knowledge and understanding of eye disease that will need to be understood for eye health promotion activities [43].

Medical imaging technologies allow for the rapid diagnosis and evaluation of a wide range of pathologies. In order to increase their sensitivity and utility, many imaging technologies such as CT and MRI rely on intravenously administered contrast agents [44].Intraocular pressure (IOP) measurement plays an important role in glaucoma diagnosis and management and the quest for a rapid, accurate, reliable method to measure IOP is still ongoing [45]. Our results suggest that the number of glaucoma medications is not predictive of quality of life further clinical trials to verify and study these outcomes are required [46].Surgeons as well as the entire ophthalmic care team should be aware of this incident to try to minimize the risk of t injury by working in a make-up free ophthalmic field [47].

Recently, fully automated computer programs are available for electronic recording. The program automatically modifies and advances the exercises as the patient's visual acuity improves. The ophthalmologist can follow the patient from the office via the internet [48].Most cataract surgery patients desire to not only enjoy excellent non- spectacle corrected distant vision, but also non-corrected near vision with glasses independence in this modern era [49].

Multivitamins: Protein malnutrition is a major public health problem in the developing world. Fruits are important sources of minerals, fiber and vitamins, which provides essential nutrients for the human health. Plants, which are sources of phytochemicals with strong antioxidant activity, have attracted a great deal of attention in recent years. Antioxidants, which inhibit the oxidation of organic molecules, are very important in diet [50].

Long chain polyunsaturated fatty acids (LC-PUFA) are the major determinants of the structure and function of retina, any impairment in their maternal and dietary supply might result in the defective retinal development, structure and function. Humans depend mainly on diet for the precursors of LC- LC-PUFA could also be supplied directly through diet; meat products and sea foods [51]. Diabetes retinopathy is a group of metabolic disorders can be controlled by taking healthy diet [52].

Avoiding Smoking: Vision is fascinatingly complex, and thus, it is not surprising that perturbation of eye sight can have many different underlying genetic causes, not to mention potential environmental and metabolic influences which are much more difficult to trace and generally polygenic in most cases [53]. An effective and safe therapy for is needed to improve signs and symptoms and to prevent ocular complications [54]. The literature review confirmed a strong association between current smoking and AMD, which fulfilled established causality criteria. Cigarette smoking is likely to have toxic effects on the retina. In spite of the strength of this evidence, there appears to be a lack of awareness about the risks of developing eye disease from smoking among both healthcare professionals and the general public [55].

Tobacco smoking is the direct cause of tobacco-alcohol amblyopia, a once common but now rare disease characterized by severe visual loss, which is probably a result of toxic optic nerve damage. Cigarette smoking is highly irritating to the conjunctiva mucosa, also affecting the eyes of nonsmokers by passive exposure (secondhand smoking) [56]. These findings provide convincing evidence that smoking may be causally associated with eye diseases. The strongest risk was found for current smokers, suggesting potential benefits of targeting education to older people who are current smokers and have signs of eye diseases [57].

Results suggest that, among persons with early or intermediate AMD, smoking and BMI are modifiable factors associated with progression to advanced AMD [58].Smoking remains the leading preventable cause of morbidity and mortality [59].Educational programs that explain the potential harms of smoking and modify the cool image associated are needed to prevent the spread of this rapidly emerging health hazard [60].

Protective lenses: Current evidence provides the basis for the design of protective lenses that minimize the hazards of sunlight exposure without significantly interfering with vision. The prescription has two components-one to protect the lens, the other to protect the retina. Ultraviolet radiation. This will protect the lens (and the exposed anterior parts of the eye) against radiation damage that accelerates aging. No advantage is gained by exposing any part of the eye to ultraviolet radiation. It is useless for vision in the intact eye and harmful to any part of the eye that absorbs it [61].

Vision screening: Vision screening to detect eye problems in school-aged children dates back at least a century. The emphasis was placed on vision screening in the preschool years and preschool screening programs have been adopted in various countries. The purpose of preschool visual screening is to identify children with possible visual problems early, which ensures that the appropriate timely assessment and early intervention are performed as required.

Treatment of refractive errors can prevent legal blindness and vision loss [62]. From the earliest times, medical practitioners have sought divine help and support to aid them as they go about their busy rounds for screening [63]. Surgeons as well as the entire ophthalmic care team should be aware of this incident to try to minimize the risk of thermal injury by working in a make-up free ophthalmic field [64]. The simplicity and the speed of this screening method make it possible for the analyst to screen a large number of visual problems [65]. The use of computational tools in the prediction of eye diseases is growing rapidly [66].

Advanced microscopy and corresponding image analysis have evolved in recent years as a compelling tool for studying molecular and morphological events in cells and tissues. Cell-based High-Content Screening (HCS) is an upcoming technique for the investigation of cellular processes and their alteration by multiple chemical or genetic perturbations [67]. Screening methods are routinely and extensively used to reduce cost and time of drug discovery [68]. Researchers quickly discovered the urgent need of screening of eye diseases for invention of drugs [69].

Conclusion

Diseases of the eye leading to blindness are almost exclusively a function of ageing. As the proportion of the elderly population increases around the world, the prevalence and effects of age-related eye diseases are also increasing. The leading causes of blindness and low vision are primarily age-related eye diseases such as age-related macular degeneration, cataract, diabetic retinopathy, and glaucoma. Age-related cataract will become an even larger percentage of the causes of blindness worldwide, and glaucoma and age-related macular degeneration will emerge as public health issues. However it is essential to raise awareness in the general population so that people can make informed lifestyle choices.

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