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ORIGINAL ARTICLE

The prevalence and risk factors of visual impairment among the elderly in Eastern Taiwan

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Abstract Visual impairment is associated with disability and poor quality of life. This study aimed to investigate the prevalence and associated risk factors of visual impairment among the suburban elderly in Eastern Taiwan. The cross-sectional research was conducted from April 2012 to August 2012. The ocular condition examination took place in suburban areas of Hualien County. Medical records from local infirmaries and questionnaires were utilized to collect demographic data and systemic disease status. Logistic regression models were used for the simultaneous analysis of the association between the prevalence of visual impairment and risk factors. Six hundred and eighty-one residents participated in this project. The mean age of the participants was 71.4 ± 7.3 years. The prevalence of vision impairment (better eye $< 6/18$) was 11.0%. Refractive error and cataract were the main causes of vision impairment. Logistic regression analysis showed that people aged 65–75 years had a 3.8 times higher risk of developing visual impairment ($p = 0.021$), while the odds ratio of people aged > 75 years was 10.0 ($p < 0.001$). In addition, patients with diabetic retinopathy had a 3.7 times higher risk of developing visual impairment ($p = 0.002$), while the odds ratio of refractive error was 0.36 ($p < 0.001$). The prevalence of visual impairment was relatively high compared with previous

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studies. Diabetic retinopathy was an important risk factor of visual impairment; by contrast, refractive error was beneficial to resist visual impairment. Therefore, regular screening of ocular condition and early intervention might aid in the prevention of avoidable vision loss.

Introduction

Visual function included visual acuity (VA), visual field, and contrast sensitivity, all coordinate together to perform daily tasks [1]. The vision domain affects activities of daily life independent of the effects of age, general health, educational level, and depression [2]. Hence, visual impairment in elderly was associated with disability [3] and lower quality of life [4]. Vision, along with systemic disease, psychological status, and interpersonal relationships, could also affect mortality and morbidity in the elderly people [5]. However, most elderly people believed that deterioration of vision is a natural process of aging and therefore usually do not seek appropriate medical attention, although many of the conditions might be treatable [6,7].

Metabolic syndrome is characterized by obesity, glucose intolerance, elevated blood pressure, and dyslipidemia. Each component of metabolic syndrome predisposes people to atherosclerosis, and when clustered together, these components promote cardiovascular diseases prominently [8]. Owing to urbanization, a more sedentary life style, and increasing life longevity, metabolic syndrome has become more prevalent [9]. Ocular complications of diabetes mellitus due to microvasculopathy as well as macrovasculopathy, such as cardiovascular disease, have distinct associations; therefore, adequate blood glucose control has been advocated to prevent diabetic retinopathy and the subsequent visual impairment. However, the role of dyslipidemia and blood pressure control in ocular disease prevention remains controversial [10].

The eastern shoreline of Taiwan is steep with the East Coast Mountain Range extending down the east coast of the island and the narrow Huatung Valley separating it from the high Central Mountain Range. There are indigenous tribes and rural villages scattered throughout the mountainous area. Although the National Health Insurance, initiated in 1995, had almost 99% coverage of the 23-million strong Taiwanese population, to most elderly residents the accessibility of medical services remained scarce due to the inconvenience caused by this geographic feature. The project was funded by the Health Promotion Administration to screen the eye conditions of the residents who had been followed-up at local infirmaries for systemic diseases such as diabetes, hypertension, or dyslipidemia. We aimed to investigate the prevalence and associated risk factors of visual impairment of the suburban elderly in Eastern Taiwan via analyzing this data directly.

Methods

The Research Ethics Committee of the Buddhist Tzu Chi General Hospital, Hualien, Taiwan, approved this study. This is a cross-sectional research, in which the visual screening program was conducted from April 2012 to August 2012, with the cooperation between one hospital and 10 local infirmaries, located mostly in suburban areas of Hualien County. Our study only enrolled the suburban elderly older than 55 years from those participants in the project funded by Health Promotion Administration. The systemic disease status was collected from medical records of local infirmaries and by questionnaires.

Ocular examinations

The standardized ophthalmic examinations were conducted, included presenting VA, automatic refractometry, noncontact tonometry, slit-lamp biomicroscopic examination, retinoscopy, and fundus examination.

The VA was measured using the Snellen chart (distributed by the Taiwna Optical) at a distance of 20 ft (~6 m). The uncorrected VA or VA with present distance spectacles of each eye was measured initially. We defined visual impairment as presenting VA worse than 6/18 in the better eye according to the criteria set forth by the World Health Organization [11]. The mean spherical equivalent refractive error was used for calculation. Myopia was defined as spherical equivalent < -0.5 diopters (D). Hyperopia was defined as a spherical equivalent $> +0.5$ D [12].The definition of ocular diseases and the details of ocular examinations are described in our previous study [13].

Determination of causes of visual impairment

The major causes of visual impairment were identified in the participants who were categorized as visually impaired. If the better-seeing eye had more than one ocular disease, the senior ophthalmologist would designate the major vision-dampening pathological condition as the cause of the visual impairment. Vision impairment was attributed to refractive error when VA improved to $>$ 6/18 with either the pinhole test or after refraction.

Age-related macular degeneration grades were assigned in accordance with the Wisconsin age-related maculopathy grading system. Cataracts were classified by use of Lens Opacities Classification System III. If the final diagnosis could not be made at the mobile medical unit, the patient