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ORIGINAL ARTICLE

Ophthalmologic abnormalities among students with cognitive impairment in eastern Taiwan: The special group with undetected visual impairment

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Purpose: Students with cognitive impairment are at increased risk of suffering from visual impairment due to refractive errors and ocular disease, which can adversely influence learning and daily activities. The purpose of this study was to evaluate the ocular and visual status among students at the special education school in Hualien.

Methods: All students at the National Hualien Special Education School were evaluated. Full eye examinations were conducted by a skilled ophthalmologist. The students' medical records and disability types were reviewed.

Results: A total of 241 students, aged 7–18 years, were examined. Visual acuity could be assessed in 138 students. A total of 169/477 (35.4%) eyes were found to suffer from refractive errors, including 20 eyes with high myopia (≤ -6.0 D) and 16 eyes with moderate hypermetropia ($+3.0$ D to $+5.0$ D). A total of 84/241 (34.8%) students needed spectacles to correct their vision, thus improving their daily activities and learning process, but only 15/241 (6.2%) students were wearing suitable corrective spectacles. A total of 55/241 students (22.8%) had ocular disorders, which influenced their visual function. The multiple disability group had a statistically significant higher prevalence of ocular disorders (32.9%) than the simple intellectual disability group (19.6%).

Conclusion: Students with cognitive impairment in eastern Taiwan have a high risk of visual impairment due to refractive errors and ocular disorders. Importantly, many students have

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unrecognized correctable refractive errors. Regular ophthalmic examination should be administered to address this issue and prevent further disability in this already handicapped group. Copyright © 2016, Formosan Medical Association. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Recently, evidence has suggested that students with cognitive impairment are at increased risk of refractive errors and visual impairment.^{1,2} Previous studies also showed the high prevalence of ocular disorders in students with cognitive impairment.^{1,2} For example, the prevalence of strabismus was found to be higher in this group than in the normal child population.^{1–4} However, effective vision tests are not regularly performed for this group in Taiwan. At the special education school in eastern Taiwan, there is a pediatrician, child psychologist, and dentist for regular care of students, but no ophthalmologist. Learning abilities of students with cognitive impairment are typically lower than those of normal students. Additionally, unrecognized visual impairment may adversely influence learning, dependence, daily activities, and social behavior. Importantly, their visual difficulties include potentially correctable refractive errors. Owing to poor expression abilities, visual problems of these students are usually neglected by caregivers. Moreover, because of the poor cooperation, the visual acuity test and examination of refractive errors are very difficult to perform in these students. Even though some students have spectacles, unsuitable correction often exists.¹ No larger study in the literature reported potentially correctable refractive errors and analyzed the current spectacles of students with cognitive impairment in Taiwan. The purpose of this study was to evaluate the ocular status, visual status, and current spectacles among students at the special education school in eastern Taiwan.

Methods

Hualien County is situated in eastern Taiwan, and has a population of 330,000 people. The National Hualien Special Education School, founded in 1992, is the only school for students with special educational needs in Hualien. It has 262 students. The majority of children and teenagers with profound intellectual or/and physical disabilities in Hualien attend this school. It is the oldest and largest special education school in eastern Taiwan, and is appropriate to represent students with cognitive impairment in eastern Taiwan.

In March 2015, all students at National Hualien Special Education School were evaluated, regardless of their previous eye condition. Written informed consent was obtained from the parents or legal guardians of all students. A full eye examination was conducted by a skilled ophthalmologist with pediatric experience. A member of school staff, who knew the student well, accompanied each student during examination. The ophthalmological assessment included general observations of visual attention and

fixation, ocular alignment by Hirschberg and/or cover test, uncorrected and corrected visual acuity measured by Landolt's C chart, refractive error by retinoscopy, anterior segment examination by slit-lamp, and fundal examination by direct ophthalmoscopy. Pupil dilatation was done only if the fundus could not be examined through an undilated pupil. Medical charts were reviewed, and the type of disability of the student was recorded. Following the examination, spectacles were prescribed to students with uncorrected refractive errors or whose current spectacles were unsuitable. The refractive status of each eye was categorized as follows: myopia, if the spherical equivalent (SE) was ≤ -1.0 D; high myopia, if the SE was ≤ -6.0 D; hypermetropia, if the SE was $\geq +1.0$ D; moderate hypermetropia, if the SE was between $+3.0$ D and $+5.0$ D; astigmatism, if the cylinder was $\geq +0.5$ D or ≤ -0.5 D; or high astigmatism, if the cylinder was $\geq +2.0$ D or ≤ -2.0 D. We used the cutoff value of 1.0 D for the SE of refractive errors due to the poor cooperation of students.

The students' visual acuity, refraction, and ocular disorders were recorded and entered into a database. The data were then grouped according to the types of disabilities of the students. Intellectual disability (ID) is defined as a level of intellectual functioning that is below average and results in significant limitations to the person's daily living skills. The classification of ID included mild ID with an intelligence quotient (IQ) of 55–69, moderate ID with an IQ of 40–54, severe ID with an IQ of 25–39, and profound ID with an IQ of ≤ 24 . Multiple disabilities (MDs) are defined as concomitant impairments, the combination of which causes such severe educational needs that they cannot be accommodated in a special education program solely for one of the impairments. A Fisher's exact test was used to compare the prevalence of ocular disorders in each group. We also compared the results of the refractive errors in the present group with results from large population studies of normal children, as well as other studies of students with cognitive impairment. This study had the approval of the local institutional review board (the Institutional Review Board/Ethics Committee of Mennonite Christian Hospital; official approval code: 15-03-005).

Results

Demographic features

The total number of students at the school was 262. Twenty-one students were unable to take part in the examination. Data were available for the 241 students who took part, which included 154 (58.8%) male and 87 (33.2%) female students. Thirty-three (13.7%) students were aged

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