ORIGINAL ARTICLE

Refractive errors in children with autism in a developing country

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Abstract

Background: In a resource-limited country visual problems of mentally challenged individuals are often neglected.
Aim: The present study aims to study refractive errors in children diagnosed with autism in a developing country.
Materials and Methods: Ophthalmic examination was carried out on children diagnosed with autism attending a school for the mentally challenged in Enugu, Nigeria between December 2009 and May 2010. Visual acuity was assessed using Lea symbols. Anterior and posterior segments were examined. Cycloplegic refraction was performed. Data was entered on the protocol prepared for the study and analyzed using Statistical Package for the Social Sciences version 17 (Chicago IL, USA).
Results: A total of 21 children with autism were enrolled in the school; 18 of whom were examined giving coverage of 85.7%. The age range was 5-15 years, with a mean of 10.28 years (standard deviation ± 3.20). There were 13 boys and 5 girls. One child had bilateral temporal pallor of the disc and one had bilateral maculopathy with diffuse chorioretinal atrophy. Refraction revealed 4 children (22.2%) had astigmatism and 2 children (11.1%) had hypermetropia.
Conclusion: Significant refractive error mainly astigmatism was noted in the children with autism. Identifying refractive errors in these children early and providing appropriate corrective lenses may help optimize their visual functioning and impact their activities of daily life in a positive way.

Key words: Autism, developing country, refractive error

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Introduction

Autism spectrum disorder (ASD) is a developmental neurological disorder characterized in varying degrees by difficulties in social interaction, verbal and non-verbal communication and repetitive behaviors.[1] The exact etiology is unknown, but multiple causes such as insult to the brain stem early in embryogenesis, genetic and environmental factors, tuberous sclerosis, congenital rubella and phenylketonuria have been implicated.[2,3] The prevalence in Nigeria is not known. The prevalence in U.S. is said to be rising rapidly over a short period and is currently estimated to be 1 in 110 children.[4] A study from South Thames, UK[5] documented a prevalence of 116.1/10,000. The authors concluded that the prevalence of autism and related ASD is substantially higher than previously reported.

Ophthalmic findings reported in children with autism include abnormal electroretinograms, deficient evoked visual potentials, atypical optokinetic nystagmus, abnormal saccades and a higher incidence of strabismus than normal.[6-12] In one study, refractive error is said to range between −4.25 DS and +3.25 DS.[11] There is a paucity of data on ophthalmic findings in children with autism in Africa.

There is variation in severity of autism symptoms. Whereas some children with autism have strong intellectual and

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language abilities, others require lifelong care.[2] It is reported that about 70% of children with ASD have intellectual disabilities.[13] It has been suggested that many children will require special education and residential care.[2]

In resource-limited countries eye care services are not optimal.[14,15] There is inadequate manpower across all cadres of eye health workers both in terms of number and distribution.[16,17] In this kind of setting, it is easy to neglect the visual problems of individuals with intellectual disabilities and poor communication skills. The purpose of this study was to identify refractive errors in children with autism in a developing country with a view to provide appropriate corrective lenses.

Materials and Methods

Background

Therapeutic Day Care Center and Boarding School Abakpa-Nike, Enugu, Nigeria is a special education center for the mentally challenged, though there is a section for normal children. Among the mentally challenged, some are under residential care, while others are day students.

Methods

Ethical clearance was obtained from the Health Research Ethics Committee of the University of Nigeria Teaching Hospital, Enugu.

Having obtained informed consent from the administrator of the school on behalf of the parents, all children with autism in the school underwent ocular examination between December 2009 and May 2010. The diagnosis of autism was made by the referral pediatricians using the Diagnostic and Statistical Manual of Mental Disorders 4th edition.[18] The school also observed the children over a period to affirm the diagnosis.

Unaided visual acuity (VA) for distance and near was assessed using Lea symbols (good - lite #250200 and #250900 respectively). The former was performed at a distance of 3 m and the latter at 40 cm. For the children who could not match the symbols on the Lea chart, the hundreds and thousands test was performed. The teachers were trained to carry out the VA test. None of the children had ever worn spectacles previously. Anterior segment was examined with torch light and head loupe by IRE and AEA. Strabismus was assessed by Hirschberg test. Ocular motility was assessed and pupillary reaction to light was also checked. Posterior segment was examined with direct and indirect ophthalmoscope after dilation of the pupils with tropicamide 1% and cyclopentolate 1% eye drops by LL and IRE. All children who could co-operate underwent cycloplegic refraction 30 min after instillation of the aforementioned eye drops. Spectacles were dispensed free of charge to those that needed them.

Data entry and analysis were performed using Statistical Package for the Social Sciences version 17 (Chicago IL, USA).

Definitions

For the purpose of this study the following definitions[19] were adopted:

1. Hypermetropia ≥ +1.50 DS
2. Myopia > −1.00 DS
3. Astigmatism ≥ ±1.00 DC.

Results

Out of the 21 children enrolled, 18 were examined (coverage 85.7%). The rest were not available in the school on the days the research team visited. The mean age of the children was 10.28 ± 3.20 years (range 5-15 years). There were 13 boys (72.2%) and 5 girls (27.8%) giving a male to female ratio of 2.6:1.

Distance VA could not be assessed in 16 children. The two children who co-operated had VA in each eye of 6/4.8 and 6/7.5 respectively. Near VA assessment was possible in only 10 children and the result is shown in Table 1.

The anterior and posterior segments were essentially normal for all the children. One child had bilateral temporal pallor of the disc and one had bilateral maculopathy with diffuse chorioretinal atrophy. These two were referred to the pediatric ophthalmology clinic of the University of Nigeria Teaching Hospital Enugu for further evaluation.

A total of 15 children co-operated for cycloplegic refraction. The results are shown in Table 2. 6 children (33.3%) had significant refractive error by definitions of the study; 4 children (22.2%) had astigmatism and 2 (11.1%) had hypermetropia. Among the 4 children with astigmatism, 1 had mixed astigmatism in both eyes; 1 had simple myopic astigmatism in both eyes; 1 had compound hypermetropic astigmatism in the right eye and simple hypermetropic astigmatism in the left eye; and 1 had mixed astigmatism in the right eye and compound hypermetropic astigmatism in the left eye [Table 2].The spherical correction in the children ranged from −1.00 DS to +4.00 DS while the cylindrical correction ranged from −1.50 DC to +2.00 DC. One child had anisometropic hypermetropia of +3.00 DS (right eye +1.00 DS and left eye +4.00 DS). Spectacles were given to the six children. The prescription for the spectacles was based on the retinoscopy findings.

Discussion

Hypermetropia and astigmatism were the major refractive errors in our series. This is similar to the findings of Denis

Table 1: Near vision distribution of the children

Visual acuity (decimal notation)	Right eye Number (%)	Left eye Number (%)
1.0	4 (40)	4 (40)
0.80	3 (30)	3 (30)
0.63	1 (10)	
0.50	1 (10)	1 (10)
0.40		1 (10)
0.25		1 (10)
0.16	1 (10)	
Total	10 (100)	10 (100)

Table 2: Refractive errors in the children with autism

Refraction	
Right eye	**Left eye**
Plano	Plano
+1.00 DS	+1.00 DS
Plano	Plano
−0.50 DS/+2.00 $DC_{\downarrow 90°}$	−1.00 DS/+2.00 $DC_{\downarrow 90°}$
+1.75 DS	+1.75 DS
+1.00 DS	+1.00 DS
Plano/−1.50 $DC_{\downarrow 180°}$	Plano/−1.50 $DC_{\downarrow 180°}$
+1.00 DS	+1.00 DS
+1.00 DS	+4.00 DS
+1.00 DS	+1.00 DS
+0.50 DS	+0.50 DS
+1.00 DS	+1.00 DS
+1.00 DS	+1.00 DS
+1.00 DS/+1.00 $DC_{\downarrow 90°}$	Plano/+1.00 $DC_{\downarrow 90°}$
−0.50 DS/+1.50 $DC_{\downarrow 180°}$	+0.50 DS/+1.50 $DC_{\downarrow 180°}$

DC=Dioptre cylinder; DS=Dioptre sphere

et al.[10] Ikeda *et al*.[3] in their study remarked that significant refractive error, strabismus and amblyopia in that order of occurrence are some of the ophthalmologic disorders found in children with autism. Maximizing VA for activities of daily living is felt to be important for children.[20] Children with autism are faced with many challenges including poor communication skills and intellectual disabilities; identifying refractive errors and appropriate interventions may impact positively on their quality of life.

As has been reported[3] co-operation for vision screening in children with autism is poor. Many of the common VA testing charts (Lea's symbols, HOTV chart and Snellen's chart) require interaction between the child and the examiner. The flawed verbal and non-verbal communication skills of a child with autism may become a challenge during VA assessment. Spectacle prescription was based on retinoscopy findings; due to lack of co-operation for subjective refraction.

The limitations of this study include the small sample size, inability to assess visual pathway involvement and oculomotor disturbances (which may be subclinical) due to limited facilities and inability to do subjective refraction on the children. Although Gogate *et al*.[20] in a study on ocular disorders in children with learning disabilities similarly dispensed spectacle prescriptions based on retinoscopy findings if subjective refraction was not possible.

As is the experience in other parts of the world, autism may be much more common in Nigeria. A future study screening children in regular schools for autism is advocated.

Conclusion

Significant refractive errors were noted in the children with autism in this study. Vision screening and refraction services should be part of the general screening for children with autism, to help maximize vision for activities of daily living and improve developmental outcomes.

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