Prevalence of Ocular Disorders in Learning Disabled Children and Their Functional Visual Performance Before and After Providing Spectacle Correction

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Abstract

Aim: To determine the prevalence of ocular disorders and the functional visual performance in learning disabled children, before and after providing spectacle correction.

Method: A prospective, interventional, study was done in five special schools in Pune. A comprehensive ocular examination of children with IQ (Intelligence Quotient) level <70 was done in the mobile eye clinic. Visual acuity was assessed with the help of Cardiff acuity cards. Cycloplegic refraction was performed in all children whose visual acuity was <0.2 Log MAR. Necessary spectacle correction was dispensed to all children with significant uncorrected refractive error. Functional visual performance of the child with refractive error was assessed with the help of modified L.V. Prasad – Functional Vision Questionnaire administered to child’s parents with a set of 10 items and to teachers with a set of 8 items, before and two months after providing spectacles. Statistical analysis was done with SPSS. Wilcoxon sign ranking test was used for the comparison of post vs pre questionnaire scores.

Results: Out of 254 children examined, 178 (70.1%) were male. They were aged between 8-18 years. 104 children had mild learning disability (IQ of 50-69), 123 children had moderate (IQ of 35-49), 26 children had severe (IQ of 20-34) and one child had profound learning disability (IQ<20). Only 7 (2.8%) children were found to be wearing spectacles at the time of examination. 114 (44.9%) had visual acuity <0.2 Log MAR. 11 children were very uncooperative for refraction and three children had no glow on retinoscopy. Among those 100 children (200 eyes) who co-operated for refraction, 77 (38%) eyes were hypermetropic, 64 (32%) eyes had astigmatism, 53 eyes (26.5%) were myopic and six (3%) eyes were found to be emmetropic. 57 children (22.4%) had strabismus, while nystagmus was present in 37 children (14.6%), cataract in three children (1.2%) and retinitis pigmentosa in two children (0.8%) (who were siblings). It was found that improvement in functional visual performance post intervention was significant (p <0.0001) for each question.

Conclusions: There was a high prevalence of ocular disorders among learning disabled children. A comprehensive ocular examination, with refraction, followed by spectacle dispensing improved their visual function significantly.

Keywords: vision function, learning disabled, mentally retarded, refractive errors

Introduction

The term “learning disability” includes the presence of a significantly reduced ability to understand new or complex information, to learn new skills (impaired intelligence) with a reduced ability to cope independently (impaired social functioning), which started before adulthood, with a lasting effect on development. This definition is broadly consistent with that used in current version of the World Health Organization’s International Classification of Disease (ICD-10). The overall prevalence of mental disability was found to be 2.3%.2 The two terms “learning disability” and “intellectual disability” were interchangeable when used in the context of health and social care of adults. Previously the term used was ‘mental retardation’. In a study in Mangalore, India the prevalence of mental retardation was identified as 3 per 1000 in rural area and 5 per 1000 in urban area.3 Mental disorder is the most common developmental disorder, defined as a particular state of functioning that begins in childhood and is characterized by decreased intelligence and adaptive skills.4 Mental Retardation (MR) is defined as “significantly sub average intellectual functioning existing concurrently with related limitations in two or more of the following applicable adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure and work”, with such limitations manifested before age 18.5,6 Child has diminished learning capacity and doesn’t adjust well socially. Children with neurological impairment may have a combination of intellectual, physical, and sensory deficits. Sensory deficits include disorders of the visual system, and a high prevalence of both ophthalmic and ocular abnormalities.5 The difficulties encountered include: lack of literacy skills lack of verbal and fine motor skills and low interest level of optotypes.8 Few experts say that roughly 80 percent of what a child learns in school is information that is presented visually. Visual abnormalities are common in children and adolescents with intellectual disability.
Children with specific learning difficulties and reduced intellectual disability are more likely to experience anomalies of visual function than their peers. Unfortunately, many of these children never have a visual examination. If these learning disabled children have poor vision due to uncorrected refractive error in addition to mental retardation, they will not be educated enough to develop skills for better living, since vision is the better sense compared to hearing and speech.

This study aimed to determine the prevalence of ocular disorders and the functional visual performance in intellectually disabled children before and after providing spectacle correction.

Methods

This was a prospective, interventional study approved by the ethics committee of Bharati Vidyapeeth Deemed University Medical College, Pune. A list of special schools for intellectually disabled children was collected from the Zila Parishad. Permission was taken from Commissioner for disability, Government of Maharashtra to examine these children at their respective schools.

The children were recruited from special schools for intellectually disabled in and around Pune in 2013-2014. Respective school authorities were consulted and permission was taken. Parents and children were informed and consent forms were duly signed by the parents or guardians. Child’s name, age and demographic data along with Intelligence Quotient (IQ) was recorded. All the children had got their IQ tested from Sassoon General hospital and BJ Medical College Pune. Ocular history, birth history was recorded from the available records. Ocular examination was done in the mobile eye clinic at the respective educational institution in the presence of their class teacher or some familiar person for better co-operation of the child. This included slit lamp examination, ocular motility testing, cover test and color vision testing. Children whose parents did not consent, deaf/mute children and those children who did not undergo IQ testing, were excluded from the study.

According to ICD-10, the levels of severity of MR are: mild (IQ of 50-69), moderate (IQ of 35-49), severe (IQ of 20-34) and profound (IQ<20). Visual acuity (VA) for distance was assessed monocularly with the help of ‘Preferential looking’ using Cardiff acuity cards at a distance of one meter and reduced Snellen’s chart was used for near visual acuity.

Cycloplegic refraction was done in children whose visual acuity was less than 0.2 Log MAR (VA less than 6/9 or 20/30) using 1% cyclopentolate or 1% Tropicamide eye drops (only in children with no history of seizures), with Automated Refractometer and Heine’s streak retinoscopy. Subjective refraction was done in all children who were co-operative and responsive.

Questionnaires/instruments have been designed specifically for functional visual assessment in children with intellectual disability. Of these, the LV Prasad Functional Vision Questionnaire was used for the assessment of functional visual performance of the child, as it has been used in Indian context. Questionnaire was translated into the local language Marathi by two independent translators and was back translated to English by another two experts for validation before administering. 18 out of 20 questions/items were used for this study. A set of 10 questions was asked to the child’s parent and another set of 8 questions to child’s teacher before (pre-intervention) providing spectacles. Spectacles were provided to necessary children with refractive error within10 days of examination. Frames selected were of hypoallergic polyamide and full frame for all children, in attractive colors. Child’s parent/care taker were counselled regarding the child’s need to wear spectacles regularly and their importance in monitoring their child’s functional vision. The same questionnaire was then presented to parents and teachers again (post intervention).

Data analysis using non-parametric tests was carried using SPSS. Wilcoxon matched-paired signed-ranks test was performed to know if the median of the difference between ‘before’ and ‘after’ dispensing spectacles questionnaire scores differed significantly.

Results

254 children of 5 special education schools were screened. 178(70.1%)were males. The children aged 8-18 years (average age 12.6±3.2 years). 104 children had mild learning disability, 123 children had moderate, 26 children had severe and one child had profound learning disability. Only 7(3%) children, were found to be wearing spectacles at the time of their ocular examination.

Out of 254 children, visual acuity measurement with Cardiff acuity card was possible in 208 (81.9%) children as 46 (18.1%) children didn’t co-operate. They were then examined by checking fixation behavior and following patterns of light. They were deemed to have visual acuity <0.2 Log MAR (6/9).

Out of those 46 children who were fixing and following light, 12 children had mild disability, 26 children had moderate disability and 8 children had severe learning disability. 140 (55.1%) children had VA>0.2 LogMAR while 114(44.9%) children had VA<0.2 LogMAR (6/9).

Retinoscopy was done in all these 114 children but 11 children didn’t co-operate for objective refraction and 3 children were found to have no glow on retinoscopy and they were un co-operative for auto refraction.

Co-operative children were examined using trial lenses. Some children developed their own means of communication to identify the pictures, but few children were un co-operative for the subjective refraction. In such cases, the prescription was based on retinoscopy findings. So out of 100 children (200 eyes) who co-operated for refraction, 29 eyes were having simple myopia, 31 eyes had simple hyperopia, 64 eyes had simple myopic astigmatism, 24 eyes had compound myopic astigmatism, 37 eyes had compound hyperopic astigmatism, nine were found to be having mixed astigmatism and six eyes were emmetropic. The refractive errors ranged from -0.75D to -21D for myopia, +1D to +8D for hyperopia and -0.75D to -5.00D cylinder for astigmatism. All were provided with necessary spectacle correction.

Out of 254 children who underwent ocular examination, 57 children (22.4%) had strabismus, while nystagmus was present in 37 (14.6%) children (horizontal, jerk, pendular
and cyclic nystagmus), cataracts in three children (1.2%), and retinitis pigmentosa in two children (0.8%) (who were siblings). Out of 254 children, 178 were cooperative for color vision testing, of these (7.3%) were found to be defective in color vision with Ishihara chart. 76 children were uncooperative and were not able to perform color vision test. Table 1 demonstrates the comparison of Vision Function Scores by LVP-FVQ pre and post for questions asked to the teachers while table 2 demonstrates the comparison of

| Question                                                                 | Pre-intervention median score | Post-intervention median score | p-value      |
|--------------------------------------------------------------------------|-------------------------------|--------------------------------|--------------|
| Does the child have any difficulty in walking alone in the corridor at school without bumping into objects or people? | 3.0                           | 1.0                            | <0.0001      |
| Does the child have any difficulty in copying from the black board while sitting on the first bench in his/her class? | 2.0                           | 1.0                            | <0.0001      |
| Does the child have any difficulty in reading his/her text books at an arm’s length? | 4.0                           | 2.0                            | <0.0001      |
| Does the child have any difficulty in reading along a straight line? | 4.0                           | 2.0                            | <0.0001      |
| Does the child have any difficulty in finding the next line while reading when he/she takes a break and then resume reading? | 4.0                           | 3.0                            | <0.0001      |
| Does the child have any difficulty in locating dropped objects (pen, pencil, and eraser) within the classroom? | 2.0                           | 1.0                            | <0.0001      |
| Does the child have difficulty in locating a ball while playing in the daylight? | 2.0                           | 1.0                            | <0.0001      |
| Does the child have difficulty in identifying colors? (e.g., while coloring) | 2.0                           | 1.0                            | <0.0001      |

Visual Function Scores by LVP-FVQ pre & post for questions asked to the parents about their ward's performance.

**Discussion**

Measurement of visual acuity in these special children was a challenge and required patient observation of their eyes, visual attention and fixation. The key was to use intellectual age appropriate and not chronological age appropriate visual acuity measurement tests. The evaluation of visual correction in children with moderate and severe learning disability was a big challenge. This study shows a higher prevalence of ocular disorders (refractive errors, strabismus and nystagmus) among these children which is in agreement with the results of several other previous studies. Refractive errors were common in learning disabled children and their correction greatly improved the visual function in these children, which allowed them to adapt with and negotiate with the environment better.

A study from Pune showed that 45.3% children had ocular disorders, 27.3% had uncorrected refractive errors followed by strabismus in 15.8%, nystagmus in 6.8%, optic atrophy in 6.5%. This was in contrast to a study from the same region which showed that only 4-8% of normal children had an ocular problem.

A recent study from Nagpur demonstrated that out of 241 learning disabled/mentally retarded children examined, 124 children (51.5%) had ocular problems. Out of that refractive error was 49.3%, strabismus 24.1%, and nystagmus 6.9%. Myopia was the commonest refractive error followed by hyperopia and astigmatism. Ideally the visual status of the child should be assessed as soon as the child is admitted to the school and then an annual ophthalmic examination should be performed. These patients are often given insufficient ophthalmic care because they cannot co-operate with clinical examinations and further subsequent therapeutic procedures. The study had the limitations of being a questionnaire based study wherein there would be a floor and ceiling effect about scoring the question’s answers. Also about 20% of responses were given as ‘not applicable’ and hence could not be included in the statistical analysis. This was mostly because of the child’s age or intellectual status. The study demonstrated that, ocular morbidity, especially refractive errors, were common in learning disabled children. Early detection and correction of refractive errors in these children led to improved vision function. It is of utmost importance that visual deficiencies of these special children be recognized and corrected early to provide maximum potential for learning.
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