Ophthalmologic abnormalities in children from a Turkish school for the deaf

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SUMMARY: Hanioğlu-Kargı Ş, Köksal M, Tomaç S, Uğurbaş SH, Alpay A. Ophthalmologic abnormalities in children from a Turkish school for the deaf. Turk J Pediatr 2003; 45: 39-42.

The aim of this study was to determine the nature and prevalence of ophthalmologic abnormalities in deaf children. Complete ophthalmologic examinations were performed on 104 children aged 7 to 20 years from a Turkish school for the deaf. Of 104 children, 42 children (40.4%) had some form of ophthalmologic abnormality, with the vast majority (31 patients, 29.8%) being refractive errors. The prevalence of hypermetropia, myopia and astigmatism was found to be higher over the general population. Of 104 children, 19 (18.2%) had ocular motility disturbances and one had external adnexal anomaly. Two (1.8%) children had anterior segment and nine (8.6%) children had posterior segment pathologies. Routine ophthalmologic examinations should be carried out in this population because deaf children use sight to compensate for hearing problems. Ophthalmologists play an important role in the diagnosis and correction of ophthalmologic abnormalities.

Key words: deafness, visual screening, visual impairment.

Ophthalmologic screening and detection of visual problems in deaf children as early as possible is very important in two ways: Although some knowledge is acquired via the tactile, kinesthetic and olfactory senses, the vast majority of knowledge is obtained through the senses of sight and hearing. When one of these is seriously impaired, the other is used to compensate. As the degree of impairment increases, the role of the remaining sense becomes progressively more significant. Thus, the deaf population may compensate by making greater use of visual-perceptual cues than their hearing peers, and thus even a mild refractive error may reduce the visual cues available to the child[1,2]. Secondly, many researches have reported high incidences of ophthalmologic abnormalities among deaf children compared with the hearing population of the same age. A review of the literature suggests ranges of 17% to 30% among hearing children[3], compared with 44% to 65% among deaf children[1,4-7].

Therefore, particular attention must be paid to ocular abnormalities in deaf children, since early detection, full and complete diagnosis and competent programming are the bet assurances for the maximum possible social and professional adjustment of these patients[1].

This study was planned in order to determine the nature and prevalence of ophthalmologic abnormalities in our sample.

Material and Methods

The study involved 104 deaf children (68 boys, 36 girls), ranging in age from 7 to 20 years (mean 13.03±3.21). These included consecutive children who underwent routine screening examination at a deaf school in Zonguldak province, Turkey.

The children were examined with a school teacher near them and they responded by sign language which was interpreted by the teacher, or by sign and oral communication if possible.

The ophthalmological work-up included visual acuity assessment, gross confrontational field testing, color vision testing, binocular function evaluation (Titmus stereoacuity, TNO), papillary evaluation, strabismus examination, slit-lamp biomicroscopy, examination with a dilated pupil; cycloplegic retinoscopy and fundus examination.

Snellen letters were used for visual acuity assessment if oral communication was available. Capital letter E on Snellen chart was used to test visual acuity for children who used sign language for communication. Near-vision testing (33 cm) was done first, and then visual acuity at 6 m was examined. The child was required to correctly match the direction of his fingers to the arms of the E. After the child responded easily, monocular testing was introduced.

The refractive errors which necessitated earlier correction were hypermetropia of ≥1.5 diopters (D) in the presence of esotropia and of >3.0 D in the absence of manifest strabismus, myopia of >1.0 D, astigmatism of ≥1.5 D, and anisometropia of ≥2.0 D. But, the degree of refractive errors which should be corrected depended on the individual patient, who may or may not tolerate the reduction in uncorrected vision[8].

Amblyopia was detected as best corrected visual acuity of less than 20/30 in either eye resulting from either anisometropia, strabismus or large astigmatic error.

Extraocular muscle imbalance was noted when eye misalignment exceeded 10 prism diopter. In cases in which no manifest strabismus was demonstrable, 4D base out prism testing was performed.

Stereoacuity of 100 seconds of arc or better was accepted to demonstrate fine depth perception and was considered normal. Stereoacuity of less than 100 seconds was recorded as reduced and, where stereoacuity was not demonstrable, absent stereopsis was recorded.

Electrodiagnostic tests were not performed routinely, only if needed.

Results

The percentage of ocular abnormalities in the children included in this study was 40.4% sixtytwo children (59.6%) had a normal ophthalmological examination, while 42 children (40.4%) had ocular problems, and 20 of them had more than one problem (Table I).

The frequency of refractive errors in the present study was 29.8%. Astigmatism was the leading refractive anomaly (14.4%). Hypermetropia was found in 9.6% of the children, while myopia was found in 5.8%. We succeeded in correcting refractive errors in 15 (48.4%) children. The 16 children (51.6%) whose refractive errors could not be corrected had some forms of ocular abnormality such as amblyopia, anisometropia, strabismus, pigmentary retinopathy or retinitis pigmentosa. Anisometropia was detected in five children (4.8%) and amblyopia was found in 16 children (15.3%). Five of the amblyopic children were anisometropic, and the remaining had strabismus, high hypermetropia or astigmatism, or retinal pathologies which reduced visual acuity.

Table I. Ophthalmologic Abnormalities in 104 Children

Type of detect	No	(%) affected
Refractive errors	31	(29.8)
Hypermetropia	10	(9.6)
Myopia	6	(5.8)
Astigmatism	15	(14.4)
Anisometropia	5	(4.8)
Amblyopia	16	(15.3)
Strabismus	19	(18.2)
Constant esotropia	4	(3.8)
Constant exotropia	8	(7.7)
Intermittent exotropia	3	(2.9)
Sensory exotropia	1	(0.9)
Vertical muscle anomaly	3	(0.9)
Stereopsis		
Normal	56	(53.8)
Reduced	26	(25)
Absent	7	(6.8)
Unidentified	15	(14.4)
Color vision deficiency		
Present	6	(5.8)
Ocular pathology		
Cornea/Lens Anomalies	2	(1.8)
Heterochromia	1	(0.9)
Punctate lens opacities	1	(0.9)
Retina/optic disc Anormalies	9	(8.6)
Pigmentary retinopathy	7	(6.8)
*(5 rubella retinopathy)		
Retinitis pigmentosa	1	(0.9)
Optic atrophy (traumatic)	1	(0.9)
External Eyelid Anomalies		
Epicanthal folds	1	(0.9)

A disturbance of ocular motility was present in 19 cases (18.2%). Four cases (3.8%) had constant esotropia. Exotropia was detected in 12 cases (11.5%). Eight (7.7%) had constant, three (3.2%) had intermittent and one had sensory exotropia. Three (2.9%) children were found to have fourth nerve palsies.

Fifty-six children (53.8%) had normal stereopsis. In 26 (25%) cases stereopsis was reduced, and in seven (6.8%) cases it was absent. In 15

(14.4%) children, we were unable to identify the degree of stereopsis due to lack of cooperation. The cases in which stereopsis was reduced were the cases with starismus or retinal pathology with or without refractive errors.

Anterior segment anomalies were found in two children (1.8%). Heterochromia iridum was found in the patient who was recorded as having Waardenburg syndrome type II (heterochromia iridum, white forelock, deafness). Punctate lens opacities were detected in one patient with rubella retinopathy.

Posterior segment anomalies were found in nine children (8.6%). Of seven children (6.8%) with pimentary retinopathy, five cases had rubella retinopathy. The other two cases had unclassified pigmentary retinopathy. In one child with retinitis pigmentosa, the diagnosis of Usher's syndrome type I was made. Another child had traumatic optic atrophy.

Discussion

The prevalence of ocular abnormalities among deaf children has been reported to vary from 33% to 60% in previous reports (1,4-7, 9-11). In the present study, 42 children (40.4%) had ocular abnormalities which is similar to other reports.

In the study group, the most common ocular abnormality was refractive error. Of the deaf children examined, 31 (29.8%) had one or more significant refractive errors. The frequency of refractive errors in the present study was twice that found in the normal hearing population[3]. Studies from Turkey also show similar refractive error frequencies in non-deaf children within the same age ranges. Öztürk et al.[12] reported that 14% of non-deaf schoolchildren had refractive errors, while some others have reported 8.8-20% refractive error frequencies[13-15]. The average prevalence of hypermetropia at seven years is 19.1% and at 15 years is 3.6%[16]. In our study, 9.6% of children demonstrated hypermetropia. This is increased over the prevalence of 3.4% shown in the general population[17]. The high rate of hypermetropia, which involves accommodative difficulties and possible consequent amblyopia, is of uncontestable importance, because hypermetropia may retard the ability of deaf children to lip-read a problem not encountered in children with normal hearing[1].

The normal prevalence of myopia (>0.50 D) at seven years is only 1.9% and this increases to 21.8% at 15 years[16]. Overall, the normal population demonstrates a prevalence in myopia (>1.0 D) of 4.8%[17]. The prevalence of myopia in the present study was slightly increased over the normal population.

There have been some reports that high cylinder corrections are characteristic of deaf children[5,10]. In a previous study, 7-15-year-old school children were shown to have a prevalence of astigmatism (>1.0 D) of 1.7%[16]. In our study, the prevalence of astigmatism was 14.4%. This finding is consistent with other reports[5,10]. But, the reason for this increase in astigmatism in deaf children is not known[5].

In our study anisometropia was present in 4.8% and amblyopia was present in 15.3% of patients. Anisometropia has been reported to occur in 3.7% of normal children[16]. Amblyopia (best corrected visual acuity in either eye worse than 20/30) has been reported in normal schoolchildren at a rate of 1.2%[16]. It was also similar in Turkish children with the frequencies of 0.5-3.1%[12,18,19]. Anisometropia prevalence in our study was slightly increased, while amblyopia prevalence was significantly higher than in the normal population. This is due to ocular pathologies such as strabismus and anisometropia and retinal pathologies. Another reason for this may be the delay of diagnosis due to low socioeconomic level of the families.

We succeeded in fitting 15 to 31 children displaying refractive errors with corrective lenses. Other children, in whom visual acuity loss was irreversible had multiple handicaps and significant ocular pathologies.

The other most common ocular abnormality was found to be strabismus, which has been determined at different rates in previous studies. The incidence of manifest strabismus has been cited as 1.8% and 4.6% from foreign countries, while it was reported to be between 1-6% from our country[12,19-22]. In our study, 18.2% of the children had strabismus, which is significantly greater than in the normal population. In previous studies, strabismus prevalence was between 3.6% and 24.0% among deaf children[1,4,5,10].

Here, ophthalmologic screening plays an important role in order to detect visual problems related to myopic, hypermetropic or astigmatic refractive errors and amblyopia. Also, examination of the eye alignment to detect muscle imbalance is necessary. Higher prevalence of refractive and strabismic errors in the deaf population, who may

be amenable to spectacle, surgical or orthoptic treatment, makes early diagnosis essential because this population is especially dependent upon vision for their maximal cognitive, psychological and emotional development.

The retina and cochlea develop from the same embryonic layers during the sixth and seventh weeks of embryogenic development. Thus, oculoauditory syndromes have been well defined in previous reports[1,10]. In our examinations, five of seven patients with pigmentary retinopathy were found to have rubella retinopathy. One child had retinitis pigmentosa, leading to the diagnosis of Usher's syndrome (congenital deafness with retinitis pigmentosa), and another was found to have Waardenburg syndrome (deafness with heterochromia iridum, abnormal pigmentation of the skin and hair, dystopia canthorum and ectopic lacrimal puncta). Though rubella retinopathy was the most common retinal finding in previous reports[9,11], we detected rubella retinopathy in 4.8% of patients, which is similar to another study by Siatkowski[4]. This may be due to the decreased incidence of congenital rubella over the decades. But it is still the most common cause of retinopathy and deafness in endemic countries[9].

The results of this study strongly suggest that deaf children have an increased prevalence of refractive errors and of ocular pathology which necessitates earlier and more complete ophthalmologic examination. Ophthalmologists play an important role in organizing such screening programs so that related diseases may be diagnosed and treated. It must be kept in mind that this first step may be the starting point for the establishment of the hearing impaired's educational, social and psychological well-being in the future.

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