

# Eye on the Border

## From the Files of a Pediatric Ophthalmologist

**Authors:**

**Violeta Radenovich, M.D., M.P.H.** (corresponding author)  
Children's Eye Center of El Paso

**Albert M. Balesh, M.D.**  
Children's Eye Center of El Paso

**Address reprint requests to:**

Violeta Radenovich, M.D., M.P.H.  
Children's Eye Center of El Paso  
1250 E. Cliff Drive, Suite 4-D  
El Paso, Texas 79902  
Phone: (915) 577-9339  
Fax: (915) 541-1237  
[www.childrenseyecenter.com](http://www.childrenseyecenter.com)

The authors have no commercial or proprietary interest in *ifa Eyecare Software*®.

## **ABSTRACT**

**Purpose:** To provide extensive data on the ten most frequent ophthalmic diagnoses encountered in a pediatric ophthalmology practice – The Children’s Eye Center of El Paso.

**Methods:** This is a retrospective, computerized medical records study of 16,568 pediatric patients, aged 1 month to 19 years, with 71,068 total diagnoses, in El Paso, Texas between August 17, 1996 and April 11, 2005. The Children’s Eye Center of El Paso utilized a computerized medical records software program known as *ifa Eyecare Software*<sup>®</sup>.

**Results:** The most common diagnoses were refractive amblyopia (12,997, 18%), esotropia (6,473, 9%), myopia (4,781, 7%), healthy eyes (3,624, 5%), stenosis of the nasolacrimal duct (3,003, 4%), alternating exotropia (2,936, 4%), astigmatism (2,254, 3%), vernal conjunctivitis (2,242, 3%), chalazion (1,848, 3%), and strabismic amblyopia (1,737, 2%). Ninety percent (11,649) of the diagnoses of amblyopia, as well as the preponderance of diagnoses of alternating exotropia, astigmatism, and vernal conjunctivitis, were made in patients 6 years of age or older. Eighty-eight percent (5,679) of the diagnoses of esotropia, as well as the majority of diagnoses of stenosis of the lacrimal duct, chalazion, and strabismic amblyopia, were instead made in patients 4 years of age or older, with 401 (23%) diagnoses of strabismic amblyopia, nearly one quarter, made in children older than 10 years.

**Conclusion:** Refractive amblyopia, esotropia, myopia, healthy eyes, nasolacrimal duct obstruction, alternating exotropia, astigmatism, vernal conjunctivitis, chalazion, and strabismic amblyopia were the ten most common diagnoses seen in a pediatric

ophthalmology practice in the border community of El Paso, Texas. Amblyopia, esotropia, exotropia, and astigmatism were diagnosed too late for effective therapeutic intervention. We recommend early examination and vision screening of young children (aged 2 to 5 years) for amblyopia, strabismus, and refractive errors, with subsequent follow-up via a computer database employing eyecare software. Accurate electronic charting not only facilitates tabulation of precise prevalence data but is also extremely beneficial to subsequent treatment coordination and follow-up.

## **INTRODUCTION**

There have been no studies detailing extensive use of eyecare software to document and tabulate the most frequent ophthalmic diagnoses encountered by a pediatric ophthalmologist in a border community. El Paso, Texas is one such community of almost 600,000 total inhabitants and 50,000 under the age of 5 years,<sup>1</sup> in which the inaccessibility to adequate health-insurance plans, the existence of *colonias*, and a burgeoning immigration problem all impede precise prevalence data collection and standard health care delivery. In fact, the 157 *colonias* in El Paso County with their inherent lack of running water (26%), inadequate sewage systems (66%), and an average household income of less than \$15,000 a year (32%) face graver problems than preventive eyecare maintenance.<sup>2</sup> Add to this the fact that of 636 small businesses in El Paso, only 52, or 8%, offer a health-insurance plan, and the previsions by census trackers that El Paso's population is expected to reach a million people by 2025, and one begins to comprehend a clear and present recipe for disaster.

In order to stem the imminent tide and to provide better pediatric ophthalmic services to indigent border and inner city populations in El Paso and throughout the U.S., accurate electronic charting must first tabulate data precisely and then point the way to the most frequent ophthalmic diagnoses encountered, so that adequate therapeutic measures can be taken on a large and cost-effective scale.

### **PATIENTS AND METHODS**

The electronic clinical records (ifa Eyecare Software<sup>®</sup>, Germany) of 16,568 pediatric ophthalmic patients (age range of 1 month to 19 years at the time of first visit), seen in El Paso, Texas between August 17, 1996 and April 11, 2005, were reviewed. All patients had undergone a complete ophthalmic and orthoptic evaluation, and a total of 71,068 individual ophthalmic diagnoses had been made.

Visual acuity testing, measured by lined letters or Snellen testing, was essential for diagnosing amblyopia. Cover testing was employed as an aid to demonstration of small-angle or intermittent strabismus. The direct ophthalmoscope was used to detect leukocoria, a possible indicator of retinoblastoma or cataract. Light sensitivity and enlargement of the cornea prompted further investigation for glaucoma. The threshold for suspicion of more serious ocular inflammation was crossed when conjunctivitis failed to respond quickly to treatment. A high level of clinical caution was exercised for specific eye findings known to be associated with nystagmus and systemic conditions.

## **RESULTS**

Of the 16,568 patients (age range of 1 month to 19 years) with a total of 71,068 ophthalmic diagnoses, 41,895 diagnoses (59.0%) were among the most commonly seen. By far, the greatest number of diagnoses involved refractive amblyopia, with a total of 12,997 or 18.3%. An additional 20.9% of the total ophthalmic diagnoses made included esotropia (convergent strabismus), in 6,473 or 9.1%, myopia, in 4,781 or 6.7%, and healthy eyes, in 3,624 or 5.1%. Thus, almost 40% of the total ophthalmic diagnoses involved only four ocular conditions, with predominance (almost half of those or 18.3%) attributed to refractive amblyopia (**Table 1**).

In order of prevalence, the remaining six of the ten most common ophthalmic diagnoses encountered were: stenosis of the lacrimal duct (3,003 diagnoses, 4.2%), alternating exotropia (2,936, 4.1%), astigmatism (2,254, 3.2%), vernal conjunctivitis (2,242, 3.2%), chalazion (1,848, 2.6%) and strabismic amblyopia (1,737, 2.4%). They accounted for 14,020 diagnoses or 19.7% of the 71,068 total.

Refractive amblyopia, esotropia, myopia, and healthy eyes made up the vast majority of most frequent ophthalmic diagnoses (27,875 of 41,895, or 66.5%), with the others noted above accounting for 14,020 of 41,895, or 33.5%.

Ninety percent (11,649) of the diagnoses of amblyopia were made in patients 6 years of age or older (**Table 2**). Eighty-eight percent (5,679) of the diagnoses of esotropia were instead made in patients 4 years of age or older. While healthy eyes were frequently seen in children of early school age, the diagnosis of myopia was made most often in the 10-16-year-old age range (**Table 3**). The highest frequency of stenosis of the lacrimal duct was noted in children 4-6 years of age, with alternating exotropia occurring

predominantly in the 6-8-year-old age group. Both astigmatism and vernal conjunctivitis became preponderantly evident in 6-16-year-olds, with both chalazion and strabismic amblyopia diagnosed somewhat earlier at 4-10 years. Finally, 401 (23%) diagnoses of strabismic amblyopia, nearly one quarter, were made in children older than 10 years.

## **DISCUSSION**

During the first six months of life, normal visual development is rapid and continues through the first decade. As a group, young children are extremely sensitive to conditions that interfere with vision and visual development. Pediatric ophthalmologists, as well as pediatricians, must therefore detect the most important ophthalmic condition of early childhood, and that is amblyopia ex anopsia. While not the most serious ophthalmologic disease, amblyopia, the functionally defective development of the central nervous system or reduced vision in an otherwise normal eye, is the most prevalent and offers, with early intervention, the best prognosis. When detected early, amblyopia is treatable, but the potential for correction and normal visual development is inversely related to age.<sup>3</sup>

Amblyopia may be caused by common vision problems such as strabismus, uncorrected refractive errors, and deprivation secondary to occlusion. Prematurity is especially associated with eye pathology, including retinopathy of prematurity, amblyopia, strabismus, and refractive errors.

We studied our computer-based records of 16,568 patients (age range of 1 month to 19 years) with a total of 71,068 ophthalmic diagnoses, including amblyopia ex anopsia, in order to determine the prevalence of the ten most frequent ocular conditions present in

young children in a U.S.–Mexico border community. To date, the incidence of amblyopia in the general population had been estimated to be approximately 3%.<sup>4,5,6</sup>

The fact that refractive amblyopia, esotropia, myopia, and healthy eye examinations made up the clear majority of our ten most frequent ophthalmic diagnoses (66.5%) was in, and of, itself encouraging. It meant that our energies were being efficiently directed to areas where they might promote the most benefit. When identified early, those ocular disorders could be effectively treated with beneficial results to the children's vision in the future.<sup>7</sup> On the other hand, the fact that 90% of our diagnoses of amblyopia and strabismus were made in patients 6 years of age or older (school age) was undesirable from a therapeutic point of view, with detection at 3 years of age both an eventual goal and a near-requirement for effective therapeutic intervention and outcome.

While abnormalities in size, shape, and color of the anterior portion of the eye were easily detected by us through inspection, and noteworthy as harbingers of more serious conditions such as conjunctivitis, glaucoma, cataracts, or tumors, they nonetheless were a very small part of our total diagnoses, with an insignificant cost/benefit ratio. The same could also be said for urgent problems such as chlamydial and herpetic conjunctivitis, orbital cellulites, posterior uveitis, and glaucoma.

Studies of the prevalence of amblyopia and undetected vision abnormalities among preschool children in Mexico are almost nonexistent.<sup>8</sup> There is no reason to assume, however, that prevalence rates are significantly different from those in the U.S. Furthermore, with no screening programs in place to identify visual abnormalities among preschool children in Mexico, pediatric ophthalmologic services in border communities,

like our own, must serve as the first line of defense in an international effort to prevent permanent pediatric eye damage.

Visual acuity screening, cover testing, direct ophthalmoscopy, and light sensitivity testing are tools well within the reach of primary care physicians and pediatricians to detect serious eye disorders.<sup>9</sup> The extremely high prevalence of amblyopia, esotropia, and myopia in our series of patients probably reflected competent use of those techniques by local primary care physicians and pediatricians who subsequently referred their findings and patients to us.

Models of preventive intervention in both preschool and older pediatric populations are not exclusive to this side of the world either. A six-year Italian experience demonstrated similar prevalence rates to our own and stressed the importance of early therapeutic intervention in amblyopia to allow complete visual rehabilitation.<sup>10</sup>

With 66.5% of our ten most frequent diagnoses and almost 40% of our total ophthalmic diagnoses involving the four conditions of amblyopia, esotropia, myopia, and healthy eyes, the obvious and immediate importance of preschool vision screening comes to the fore. Amblyopia and strabismus must be detected at 3 years of age, not the current 6 years or greater, in order to guarantee effective therapeutic returns. The remaining 33.5% of our ten most frequent diagnoses, in the form of stenosis of the nasolacrimal duct, alternating exotropia, astigmatism, vernal conjunctivitis, chalazion, and strabismic amblyopia, while by no means unimportant, carry far less weight in terms of the collective price to be paid by society and public/private health care systems.

## **REFERENCES**

1. U.S. Census Bureau, 2004 American Community Survey.
2. 1998 KPMG Survey of Employer-Sponsored Health Benefits. *El Paso Times*. 1999.
3. Mills MD. The eye in childhood. *Am Fam Physician*. 1999;60:907-917.
4. Downing AH. Ocular defects in 60000 selectees. *Arch Ophthalmol*. 1945; 33:137-143.
5. McNeill NL. Patterns of visual defects in children. *Br J Ophthalmol*. 1955;39:688-701.
6. Dray J-P, Leibovitch I. Congenital ptosis and amblyopia: a retrospective study of 130 cases. *J Pediatr Ophthalmol Strabismus*. 2002; 39:222-225.
7. Datner EM, Jolly BT. Pediatric ophthalmology. *Emerg Med Clin North Am*. 1995; 13:669-679.
8. Juarez-Munoz IE, Rodriguez-Godoy ME, Guadarrama-Sotelo ME, Guerrero-Anaya M, Mejia-Arangure JM, Sciandra-Rico M. Incidence of common ophthalmological disorders in preschool children in Mexico City. *Salud Publica Mex*. 1996; 38:212-216.
9. Simon JW, Kaw P. *Am Fam Physician*. 2001; 64:623-628.
10. Cruciani F, Mastromarino A, Latini M, Paganelli G, Rocca M, Fiore F, Melino G. *Clin Ter*. 1993; 142:411-420.

**TABLE 1****TEN MOST FREQUENT PEDIATRIC OPHTHALMIC DIAGNOSES****(Total Diagnoses 71,068 from August 17, 1996 – April 11, 2005)**

<b><u>ICD-9 Code</u></b>	<b><u>Diagnosis</u></b>	<b><u>Number</u></b>	<b><u>Percent</u></b>
368.03	Refractive amblyopia	12,997	18.3
378.0	Esotropia	6473	9.1
367.1	Myopia	4781	6.7
V72.0	Healthy eyes	3624	5.1
375.56	Stenosis nasolacrimal duct	3003	4.2
378.15	Alternating exotropia	2936	4.1
367.20	Astigmatism	2254	3.2
372.13	Vernal conjunctivitis	2242	3.2
373.2	Chalazion	1848	2.6
378.01	Strabismic amblyopia	1737	2.4
<b>Total</b>		<b>41,895</b>	<b>59.0</b>

**TABLE 2****PREVALENCE OF FREQUENT PEDIATRIC OPHTHALMIC DIAGNOSES****(Most Frequent Diagnoses 41,895 from August 17, 1996 – April 11, 2005)**

<b><u>Diagnosis</u></b>	<b><u>Age Group (yrs)</u></b>	<b><u>Number</u></b>	<b><u>Percent Cases</u></b>
Refractive amblyopia	≥ 6	11,649	89.6
Esotropia	≥ 4	5679	87.7
Myopia	10-16	2988	62.5
Healthy eyes	≥ 6	3340	92.2
Stenosis nasolacrimal duct	4-6	1607	53.5
Alternating exotropia	6-8	1126	38.4
Astigmatism	6-16	1736	77.0
Vernal conjunctivitis	6-16	1897	84.6
Chalazion	4-10	1082	58.5
Strabismic amblyopia	4-10	1238	71.3
<b>Total</b>		<b>32,342</b>	<b>77.2</b>

**Table 3****AGE-SPECIFIC PREVALENCE CLUSTERS OF OPHTHALMIC DIAGNOSES****(Most Frequent Diagnoses 41,895 from August 17, 1996 – April 11, 2005)**

<b><u>Diagnosis</u></b>	<b><u>Prevalent Age Group</u></b>	<b><u>Number</u></b>	<b><u>% Diagnoses</u></b>
Refractive amblyopia	6 – 12 yrs	9,901 / 12,997	76.2
Esotropia	4 – 8 yrs	3,849 / 6,473	59.5
Myopia	10 – 16 yrs	2,988 / 4,781	62.5
Healthy eyes	8 – 12 yrs	1,906 / 3,624	52.6
Stenosis nasolacrimal duct	2 – 6 yrs	1,299 / 3003	43.3
Alternating exotropia	6 – 10 yrs	1,045 / 2,936	35.6
Astigmatism	6 – 12 yrs	1,378 / 2,254	61.1
Vernal conjunctivitis	8 – 14 yrs	1,434 / 2,242	64.0
Chalazion	4 – 10 yrs	869 / 1,848	47.0
Strabismic amblyopia	6 – 10 yrs	1,051 / 1,737	60.5
<b>Total</b>		<b>25,720 / 41,895</b>	<b>61.4</b>