

# Screening in a School for Visual Acuity and Amblyopia

Ejaz Ahmad Javed, Muhammad Sultan

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## ABSTRACT

**Objective:** To detect the visual acuity by Snellen visual acuity chart and then to find out the incidence of amblyopia. **Study Design:** A descriptive and observational study **Setting:** School health section of Divisional public school and eye department of Allied Hospital, PMC, Faisalabad. **Period:** 15 December, 2008 to 31 March, 2009. **Subject and Methods :** A total of 2600 school children between age 8 to 16 years were included in the study. The visual acuity at 6 meters was checked. The pin hole vision and vision with glasses was done of each student for each eye (right and left). The cover, uncover, alternate cover-uncover tests, Hirschberg test (to observe the deviation) and ocular movements were done for each child. Distance direct ophthalmoscopy, and Bruckner's test(to confirm the deviation) were performed at the same setting. Children having defective vision were checked further at Eye department of Allied Hospital, PMC, Faisalabad. Here slit lamp examination was done to rule out corneal, lens or vitreous opacities. The anterior chamber activity was noted Cycloplegic

refraction and fundus examination of the selected subjects was done. All the findings were entered in the Proforma. **Results:** Out of 2600 children, 383 (14.73%) had glasses and normal 6/6, 6/6 vision. Seven children (0.27%) had defective vision. 13 children (0.50%) without glasses had vision less than normal. A total of 20 children (0.77%) were found to be having amblyopia. The total children with glasses were 390(15%) while 2210 children (85%) were without glasses and having normal 6/6, 6/6 vision. Anisometropic amblyopia was found in 8 children (0.31%), isoametropia in 6 children (0.23%), strabismic amblyopia in 3 children (0.12%) and stimulus deprivation amblyopia in 3 children (0.12%). **Conclusion:** The study showed that amblyopia is found about 1% in the educated families. This can be further eliminated or decreased with routine or periodical check up of the children not only in school but also at the pre school age. **Key Words:** Amblyopia, Snellen's, visual acuity, cycloplegic refraction, SLE.

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## INTRODUCTION

Early detection of refractive errors in children is very important. It prevents the development of amblyopia<sup>1</sup>. Amblyopia(Greek:dull vision.Amblys = dull, ops = eye)is not specific to the eye rather it is located in the visual area of brain including lateral geniculate nucleus and the striat-cortex<sup>5</sup>.The amblyopia is usually defined as difference of at least two snellen lines of visual acuity. The amblyopia however can range from missing just a few letters on the snellen,s chart to dense amblyopia of hand movement vision. The cross sensitivity is affected with significantly loss of spatial resolution is. The amblyopia show better vision by reading a single optotype than reading a line of multiple optotys (crowding phenomenon).The vision correction

or restoration with glasses and patching is possible upto a certain age. Beyond this age limit, visual improvement with any procedure (optical/surgical /medical) is impossible.

At birth, vision is probably in the range of counting fingers, because of the immaturity of visual centers in brain. The normal visual development is stimulated by signals generated from clear in focus retinal images<sup>2</sup>.A blurred or distorted retinal image stimulates abnormal neurodevelopment of visual centers in the brain which result in poor vision or "Amblyopia"<sup>3</sup>. The visual development is most critical during the first 3 to 4 months of age, which is termed as the critical period of visual development. At birth ,eye alignment is variable.

70% of infants showing a small variable exo-deviation, 30% having straight eyes and less than 0.5% having variable eso-deviation.<sup>4</sup>

The severity of the amblyopia depends upon several factors.

1. When the abnormal stimulus began.
2. Length of exposure to abnormal stimulus.
3. Severity of the image blur.

The children are more susceptible to amblyopia during critical period of visual development. The earlier the intervention, the better the prognosis for amblyopia. Even children who present after 8 years of age may benefit from amblyopia therapy. The children who present after the critical period with congenital cataracts may show significant visual improvement with aggressive amblyopia management.<sup>6</sup>

In children younger than 10 years of age, it is good idea to perform a limited patching trial.<sup>7</sup>

The infantile esotropia has the highest incidence of strabismic amblyopia, while amblyopia is uncommon in intermittent strabismus.<sup>8</sup>

Anisometropic amblyopia is caused by a difference in refractive errors between two eyes. Such patients often go undetected because there are no overt signs of the amblyopia such as strabismus. These patients have straight eyes and have peripheral fusion and usually develop some stereopsis. Even hypermetropia of +1 DS anisometropia can cause significant amblyopia and +3DS can cause severe amblyopia with visual acuity of approximately 6/60. While myopic anisometropia how ever must be at least -4 to -6DS, difference in two eyes

in order to cause amblyopia. Because such children use less myopic eye for distance and more myopic eye for near. But if astigmatism is asymmetric (e.g. + 1.50 or more) can cause anisometropic amblyopia<sup>9</sup>. High hypermetropia e.g. +5DS can result in decreased vision and amblyopia if not treated in early childhood<sup>10</sup>. Bilateral amblyopes do not fully accommodate, so it is important to give full hypermetropic correction<sup>10</sup>.

The bilateral symmetrical astigmatism of +3DC or more also can result in bilateral amblyopia. Amblyopia due to high astigmatism is called meridional amblyopia. Bilateral media opacities can also cause bilateral amblyopia e.g. Peter's anomaly and congenital cataract. Eccentric fixation is a characteristic of severe amblyopia. These patients use perifoveal area for vision. Eccentric fixation is present under monocular or binocular conditions and is a sign of severe, often irreversible amblyopia.

**Table 1:**  
**Age Range of Children**

S. No.	Age range	Children	Percentage
1	8-10	630	24.23
2	10-12	700	26.92
3	12-14	690	26.54
4	14-16	580	22.31
Total		2600	100%

**Table 2:**  
**Anisoametropic Amblyopia (8 Children)**

Sr. No	Vision		Vision with Pin hole		Vision with glasses		Refraction					
	R	L	R	L	R	L	R			L		
1	6/60	6/9	6/36	6/6	6/36	6/6	+6.0 DS	--	--	+0.5 DS	--	--
2	6/60	6/12	6/36	6/6	6/36	6/6	+8.0 DS	+3.0 DC	60°	+0.75 DS	+0.5 DC	30°
3	6/24	6/6	6/24	6/6	6/34	6/6	+4.0 DS	+ 0.5 DC	180°	--	--	--
4	6/9	6/36	6/6	6/24	6/6	6/24	+0.5 DS	+0.5 DC	40°	+3.0 DS	+1.0 DC	60°
5	6/12	6/60	6/6	6/36	6/6	6/36	--	+0.5 DC	80°	+10.0 DS	+3.0 DC	130°
6	6/9	6/36	6/6	6/24	6/6	6/24	+0.5 DS	--	--	+4.0 DS	--	--
7	6/6	6/34	6/6	6/18	6/6	6/18	+0.05 DS	+0.5 DC	90°	+3.0 DS	+2.0 DC	80°
8	6/12	6/36	6/6	6/18	6/6	6/18	+0.05 DS	--	--	+3.5 DS	--	--

**Table 3:  
Isoametropic Amblyopia (6 Children)**

Sr. No	Vision		Vision with Pin hole		Vision with glasses		Refraction					
	R	L	R	L	R	L	R			L		
1	6/24	6/24	6/18	6/18	6/18	6/18	-8.0 DS	--	--	+9.0 DS	--	--
2	6/60	6/60	6/24	6/24	6/24	6/24	-12.0 DS	--	--	-11.5 DS	--	--
3	6/36	6/36	6/12	6/12	6/12	6/12	+10.0 DS	--	--	+10.0 DS	--	--
4	6/60	6/60	6/18	6/18	6/18	6/18	-6.0 DS	--	--	-6.0 DS	--	--
5	6/24	6/24	6/12	6/12	6/12	6/12	-4.0 DS	-2.0 DC	180°	-3.0 DS	-2.0 DC	170°
6	6/36	6/36	6/12	6/12	6/12	6/12	-2.0 DS	-4.0 DC	70°	-2.0 DS	-4.0 DC	90°

**Table 4:  
Strabismic Ambliopia (3 Children)**

Sr. No	Vision		Vision with Pin hole		Vision with glasses		Refraction					
	R	L	R	L	R	L	R			L		
1	6/9	6/36	6/6	6/36	6/6	6/36	-0.5 DS	--	--	-1.0 DS Exo 30°	--	--
2	6/6	6/60	6/6	6/36	6/6	6/36	-0.5 DS	--	--	-0.5 DS Exo 25°	--	--
3	6/60	6/24	6/36	6/9	6/36	6/18	-1.0 DS Exo 45°	--	--	-0.5 DS	--	--

**Table 5:  
Sensory / Stimulus Deprivation Ambliopia (3 Children)**

Sr. No	Vision		Vision with Pin hole		Vision with glasses		Refraction					
	R	L	R	L	R	L	R			L		
1	6/6	6/60	6/6	6/60	6/6	6/60	--	--	--	Corneal haze	--	--
2	6/60	6/9	6/60	6/6	6/60	6/6	Corneal Scar	--	--	--	--	--
3	3/60	6/6	CF	6/6	3/60	6/6	Aphakia + 6.0 DS corneal haze	--	--	--	--	--

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## MATERIALS AND METHODS

The screening was conducted from 15 Dec. 2008 to 31 March, 2009. The age range of the participants in the screening program was between 8 to 16 years. One medical technician, one staff nurse, one medical attendant were trained in the screening program. The illuminated Snellen chart was installed at 6 meters in the school health section. The visual acuity was done for both eyes of each student. One eye was properly occluded with an occlude and vision was recorded with out glasses, with glasses and with pinhole. The chart was rotated after checking one eye so that the child may not memorize the test words. The Hirschberg test and Bruckner's test were done after checking the vision. The cover, uncover and alternate cover uncover tests were performed in cases of deviation or reduced visual acuity. The pin-hole test was done in cases of all the students having visual acuity less than 6/6. Then slit lamp examination was performed for lens opacities, cornea, or vitreous changes. Cycloplegic refraction fundus examination SLE, were done for all students having visual acuity less than normal at Eye Department of Allied Hospital, Faisalabad. The amblyopia was diagnosed if the visual acuity was one or two lines less than the other eye or both eyes less than normal, when all correcting measures were adopted. Then all the findings were entered in the proforma.

## RESULTS

The screening for vision and detection of amblyopia was done on 2600 students whose age ranged between 8 to 16 years. The visual acuity of all the participants was done on illuminated snellen chart. There were 383 students (14.73%) having visual acuity 6/6, 6/6 with their own glasses. Seven students (0.27%) were with glasses but had defective vision. There was 13 students (0.50%) with out glasses but their vision was defective. Out of 2600 children 20 (0.77%) were found to be having amblyopia.

There were 390 students (15%) with glasses, and 2210 (85%) without glasses. All had normal vision of 6/6, 6/6.

Anisometropic amblyopia was found in 8 students (0.31%), isoametropia in 6 children (0.23%), strabismic amblyopia in 3 (0.12%) and stimulus deprivation amblyopia in 3 children (0.12%). This study shows that amblyopia is uncommon in the educated families. It is treatable if diagnosed at early age. The public awareness is the key to detect the defective vision and refer the patient for proper management.

## DISCUSSION

The measurement of visual acuity is widely accepted indicator of amblyopia and is thought by some to be the only effective screening test. Amblyopia is defined as a best corrected snellen line acuity of 6/12 or worse in either eye and/or an inter ocular difference of two snellen lines or more<sup>[11]</sup>. In one study it was found that incidence of squint was 4.75% and amblyopia 2-3%<sup>(12)</sup>. In our study the total amblyopia was 0.77% of which strabismic amblyopia was only 0.12%. As our study was on the subjects having particular age limit between 8 to 16 years and so it was not population based.

There is evidence that early recognition and treatment of squint, amblyopia and significant ametropia will produce benefits in terms of a reduced frequency and severity of permanent amblyopia<sup>13</sup>.

The plasticity of the visual system decreases rapidly over the first 6 to 8 years of life. This fact strongly suggests the advocacy of early treatment<sup>14</sup>.

Our best tool to diagnose amblyopia was the snellen visual acuity. It was said by a researcher, "the measurement of visual acuity is the most widely accepted indicator of amblyopia"<sup>15</sup>.

A study was carried out at OPD of Khyber teaching hospital and the researchers found many common eye diseases in the children. The refractive errors showed a higher proportion<sup>16</sup>.

The above study was population based while our study was in a specific school students with defined age limit. An other Pakistani researcher found that the refractive errors which account mostly for vision and visual handicaps were the third largest cause of blindness in Pakistan.<sup>17</sup>

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One researcher found common forms of childhood esotropia. He discussed various curable forms of childhood esotropia with various management options.<sup>18</sup>

A local study showed the prevalence of squint 1.6% and found that esotropia was also more likely to be amblyogenic than exotropia. In our study strabismus contributed 0.12% in amblyopia. In this study the author showed importance of screening in children and prevention of blindness.<sup>19</sup>

The magnitude of the childhood problems can be assessed by a study conducted in Muscat, Oman. In this study 416157 school children were evaluated for the visual status and it was found that 6.9% students has defective vision.<sup>20</sup> While in our study the defective vision was only 0.77%. The an Isometropic amblyopia in children can be corrected with refractive correction e.g IOL implantation or refractive corneal surgeries.<sup>21</sup>

### CONCLUSIONS AND SUGGESTIONS

The results of the study highlight several important facts;

- i. Amblyopia is uncommon in educated families.
- ii. Visual testing and screening should be done at pre-school age to detect amblyopia at younger age which is sensitive period for treatment.
- iii. An optometrist and orthoptist should be appointed at each school.
- iv. Routine check-up of vision and repeated refractions should be done.
- v. Health education regarding the advantages of glasses, refraction or occlusion therapy should be practiced.

### REFERENCES

1. Williams C, Northsione, K, Harred R.A. et al. Amblyopia treatment out come after screening before or at age 3 years follow up from Randomized trial. Br. J. Ophthalmol 2002, 1549.
2. Wright KW, Visual development and amblyopia, Text Book of Ophthalmology. 1977, P: 25-266.
3. Atkinson: Development of Optokinetic nystagmus in the human and monkey infant; an analogue to development in Kittens; and developmental

neurobiology of vision, New York, Plenum press. 1977.

4. Soudhi N., Archer SM., Helveston EM. Development of normal ocular alignment. J. Ped Ophthalmol Strab. 1988;25:210-1.
5. Kenneth, WW. Visual development and Amblyopia. Textbook of Ophthalmology 1997. 255-266.
6. Oliver, M, et al. Compliance and results of treatment for amblyopia in children more than 8 years old. Am. J. Ophthalmol. 1986: 102:340-345.
7. Brown M.H., Ederlman P.M. Conventional occlusion in the older amblyopia. Am Orthop J. 1976; 26,34-6.
8. Burden, The Stigma of Strabismus, Arch Ophthalmol., 1994; 112, 302.
9. Von, Noorden G.K., Crawford M.L.J, Levacy RA. The lateral : geniculate nucleus in human anisometropic amblyopia: invest ophthalmol, vis Sci. 1983:74:788-790.
10. Raab, E. Refractive amblyopia, Int. Ophthalmol. Clim. 1971:11:155.
11. Douglas, K Newman, Miranda M. East. Pre School Vision the Screening: Negative Predictive Value for Amblyopia. Br J. Ophthalmol. 1999:83,676-679.
12. Von Noorden GK, In Burian and Von Noorden, Binocular Vision and Ocular motility. 4<sup>th</sup> Edition. St Louis: CV Mosby. 1966.
13. Calcutt C, Early Surgery in Strabismus patients. Br. Orthop J. 1971: 28, 60-5.
14. Harwerth, RS, Smith EL, Grawford ML, Noorden JV, G.K. Behavioral studies of the sensitive periods of development of visual function in monkeys. Behav Brain Res. 1990:41:179-98.
15. Williamson TH, Andrews R, Dutton GN, Murray G, Graham N, Assessment of an inner city visual screening programme for preschool children. Br. J. Ophthalmol 1995; 79, 1068-73.
16. Seth S, Junaid M, Saeed N, Kundi NK, Pattern of common Eye diseases in children in OPD of Khyber Teaching Hospital, Pak. J. Ophth 2008:24:166-170.

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17. Durani I. Blindness Statistics for Pakistan, Pak. J. Ophthalmol 1999; 15: 1-2.
  18. Mohny BG, Huffaker K.K, Common forms of childhood esotropia, Ophthamology. 2001, 108:805-9.
  19. Qamar AR. Eye Screening in school children. Pak. J. Ophthalmol. Vol. 22, April 2006, P. 81.
  20. Khandekar RB, Abdu, Helmi S. Magnitude and Determinants of refractive errors in Omani School children, Saudi Med. J 2004;25:1388-93.
  21. Brown SM Verisye IOL implantation in a child with an isometropic amblyopia. J.Cataract Refract surg. July 2008, 34(7): 1057-8(Medline).

#### **AUTHORS**

- **Dr. Ejaz Ahmad Javed**  
Senior Registrar, Ophthalmology  
Allied Hospital Faisalabad
- **Dr. Muhammad Sultan**  
Head of Ophthalmology Department  
PMC /Allied / DHQ Hospitals Faisalabad