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Screening of school children between age group of 5-15 years to detect the prevalence of amblyopia and type of amblyopia

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Abstract
Background: Amblyopia is the most common cause of monocular vision loss in children and as amblyopia is a major preventable and treatable cause of pediatric low vision, early detection and treatment of amblyopia is very important to reduce the prevalence of amblyopia.
Materials and Methods: A cross sectional study was conducted during the school health check up visits conducted by ophthalmology department in tertiary care teaching hospital for screening of eye disorders in school children who belongs to the age group of 5-15 years over a period of 1 year in which 813 children underwent screening, among them 110 children with the reduced vision were referred to hospital for detailed ophthalmic evaluation which includes cycloplegic refraction and dilated fundus examination. Amblyopia was detected in children with reduced best corrected visual acuity.
Results: A total of 813 study subjects were screened. Out of them 110 (13.5%) were found to have diminished vision. When the study subjects with diminished vision were subjected for further tests, 18 (2.2%), (p value is 0.494) of them were found to have amblyopia. Amblyopia was present in 10 (18.9%) females and 8 (14%) males. Anisometropic amblyopia was the most common type of amblyopia found in 10 (55.6%) study subjects, followed by meridional and strabismus type of amblyopia in 4 cases each (22.2%). Among strabismus, exotropia was seen in more study subjects 4(0.5%) than esotropia in 2 cases (0.2%). A higher number of moderate grade of amblyopia was seen than mild grade of amblyopia.
Conclusion: The results indicate the importance of screening school going children for amblyopia and the importance of early detection and treatment.

Keywords: strabismus, anisometropia, astigmatism, amblyopia, prevalence, myopia

Introduction

Amblyopia is defined as a difference in the best corrected visual acuity (BCVA) between the two eyes of two or more Snellen lines. A best corrected visual acuity of less than or equal to 6/12 bilaterally on the Snellen's chart. Normal visual acuity lays the foundation for binocular single vision [1]. When significant interruption of normal visual development occurs, then amblyopia is the term used to describe this diminution of vision. Amblyopia poses an important socioeconomic problem, especially since the risk of the amblyopic patient becoming blind is significantly higher than in the general population [2]. Amblyopia is avoidable and to a degree treatable and deserves the best attention of the ophthalmologist. Amblyopia remains as one of the most confused areas of ophthalmology. Amblyopia screening and treatment are efficacious, but cost effectiveness remains a concern. Refractive correction alone may successfully treat anisometropic amblyopia in 25-75% of patients [3, 4].
Early detection of amblyopia is very important for appropriate and effective treatment in time, eventhough it can be still treated in older age in childhood [5]. Recent evidences on successful treatment of amblyopia in children up to 12 years old are more encouraged. This helps in identifying undiagnosed amblyopes who have been missed in their earlier screening programs or those living in countries with poor medical services where there no screening programs [6]. Eventhough the global international prevalence of amblyopia is 1.6–3.6%, respective data available concerning the prevalence of amblyopia and refractive error in different geographical areas is still inadequate [7, 8].
Even though the amblyopic children who are undergoing occlusion therapy had a quicker visual acuity improvement, at the end of 6 months of treatment Atropine eye drops used for penalization of the sound eye is proved to be as effective as occlusion therapy. In addition patients who used atropine eye drops once a week showed better improvement in visual

acuity and also they had a better patient compliance [9].
Treatment of amblyopia is highly effective in amblyopic children under 7 years of age. Children up to 13 years of age showed significant improvement in vision with patching the sound eye and penalization. There is approximately 25% of recurrence rate after the end of amblyopia treatment with occlusion therapy as well as penalization of the sound eye with atropine eye drops [10].

Materials and Methods

A cross sectional study was conducted during the school health check up visits conducted by ophthalmology department of tertiary care teaching hospital for screening of eye disorders in school children who belongs to the age group of 5-15 years over a period of 1 year in which 813 children underwent screening, among them 110 children with the reduced vision were referred to hospital for detailed ophthalmic evaluation which includes cycloplegic refraction and dilated fundus examination. Amblyopia was detected in children with reduced best corrected visual acuity.

Method of collection of data

Vision testing of both the eyes were done for distant vision and near vision using Snellen's chart. Ocular movements test, Hirschberg's test, cover-uncover test, anterior segment examination was done by torch light. Students with poor vision would be noted down in a separate register. A prescription slip will be given to each student. A note will be given to the teachers which they would be asked to hand over to the respective parents, regarding their problem and importance of correction and a fixed date will be given them to visit tertiary hospital ophthalmology out patient department along with their parents for detailed ophthalmic evaluation.

Detailed ophthalmic evaluation in hospital includes

1. Vision testing using Snellen's chart for both distant and near vision.
2. Hirschberg's test, cover, uncover test note any ocular deviations.
3. Ocular movements examination.
4. Colour vision testing using Ishihara test.
5. Anterior segment examination using slit lamp biomicroscopy.
6. Squint evaluation for children with the ocular deviation.
7. Cycloplegic refraction after using 2% Homide eye drops with Welch Allyn streak retinoscope.
8. Dilated fundoscopy examination using direct ophthalmoscope and indirect ophthalmoscope.

Inclusion criteria: Children in the age group of 5-15 years in the selected schools of field practice area.

Exclusion criteria

- Those who are not willing to participate.
- Children with defective vision due to other reasons.
- Absentees on the day of examination.
- School children aged less than 5 years and school children aged more than 15 years.

Statistical Analysis

SPSS (Statistical Package for Social Sciences) version 20 was used to perform the statistical analysis. Descriptive statistics of the explanatory and outcome variables were calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables. Inferential statistics like Chi-square test / Fisher's exact test was applied for categorical variables. P value <0.05 was considered statistically significant.

Results

In our study, a total of 813 study subjects were screened.

Table 1: Distribution of the study subjects according to gender and diminished vision.

Gender	Diminished vision		Total
	No	Yes	
Male	352	57	409
	43.3%	7.0%	50.3%
Female	351	53	404
	43.2%	6.5%	49.7%
Total	703	110	813
	86.5%	13.5%	100.0%

In our study, a total of 110 (13.5%) out of 813 screened had diminished vision. In that 57 (7%) were males and 53(6.5%) were females.

Table 2: Distribution of the study subjects according to gender and amblyopia

Amblyopia	Sex		Total
	Male	Female	
Absent	49	43	92
	86.0%	81.1%	83.6%
Present	8	10	18
	14.0%	18.9%	16.4%
Total	57	53	110
	100.0%	100.0%	100.0%
Chi square - 0.469			
p value - 0.494			

With respect to gender, amblyopia was present in 10 (18.9%) of females and 8 (14%) of
Males in our study.

Table 3: Types of amblyopia.

Amblyopia	Frequency	Percent
Anisometropic amblyopia	10	55.6
Meridional amblyopia	4	22.2
Strabismic amblyopia	4	22.2
Total	18	100.0

In this study, Anisometropia amblyopia was the most common type of amblyopia found in 10 (55.6%) of the study subjects, followed by meridional and strabismus type of amblyopia in 4 cases each (22.2%).

Table 4: Grades of amblyopia

Grade	Frequency	Percent
Mild	7	38.9
Moderate	11	61.1
Total	18	100.0

11 (61.1%) and 7 (38.9%) had moderate and mild type of amblyopia

Table 5: Types of gaze

Gaze	Amblyopia		Total
	Absent	Present	
Esotropia	0	2	2
	0.0%	11.1%	2%
Exotropia	2	2	4
	3%	11.1%	5%
Ortho	793	14	807
	99.7%	77.8%	99.3%
Total	795	18	813
	100.0%	100.0%	100.0%

In this study, Orthotropia was the most common type of gaze found among the screened study subjects (n – 807, 99.3%), followed by exotropia in 4 study subjects (0.5%) and esotropia in 2 cases (0.2%). Among the study subjects who had amblyopia, ortho was the most common type of gaze found in 14 study subjects (77.8%).

Table 6: Vision of the study subjects who had diminished vision

Vision		6/12.	6/18.	6/24.	6/36.	6/6.	6/60.	6/9.	CF - 1 mt	CF - 2 mt	CF- 3 mt	Total
Right Eye	n	32	12	13	12	3	2	33	-	-	3	110
	%	29.1	10.9	11.8	10.9	2.7	1.8	30	-	-	2.7	100
Left Eye	n	29	17	5	1	4	-	49	2	1	1	110
	%	26.4	15.5	4.5	0.9	3.6	-	44.5	1.8	0.9	0.9	100

33 (30%) and 49 (44.5%) had diminished vision of 6/9, followed by 32 (29.1%) and 29 (26.4%) in right and left eye respectively.

Table 7: Treatment provided for amblyopics

Treatment	Amblyopia		Total
	Absent	Present	
Spectacles	92	2	94
	100.0%	11.1%	85.5%
Spectacles and patch	0	16	16
	0.0%	88.9%	14.5%
Total	92	18	110
	100.0%	100.0%	100.0%

In this study, Spectacles was provided to 94 (85.5%) of the study subjects who had diminished vision, of which 2 (11.1%) had amblyopia. 16 (14.5%) were treated with both spectacles and patch, of which 16 (88.9%) had amblyopia.

Discussion

Amblyopia is a functional reduction in visual acuity caused by abnormal visual development early in life. It is the most common cause of pediatric visual impairment, occurring in 1 to 4 percent of children. Early detection of amblyopia and/or amblyopia risk factors improves visual outcomes [14]. This is the basis for screening preschool-age children for vision problems and amblyopia. Therefore School going children, form an important large target group and school vision screening plays an important part in early detection of amblyopia and initiation of appropriate therapy, which is of immense value towards preventing the development of lifelong visual morbidity.

Vision screening in children is recommended for detection of potentially treatable disorders which causes amblyopia in school children [14-16].

In the present study, out of 813 study subjects screened, in our study, among the study subjects (n–110, 13.5%) who had diminished vision, amblyopia was found to be present in 18 (2.2%) and absent in 92 (11.3%) respectively. p value is 0.494 which is statistically insignificant. So the**,** the prevalence of amblyopia in our study is 2.2%, which is consistent with international results of 1.6–3.6%. It is very comparable to regional developing countries like Saudi Arabia (1.85% in 6–12 years children) [17] and Central China with nearly similar prevalence of severe amblyopia to ours (2.16% in primary school children) [18]. It is quite similar to countries as Sweden where prevalence of amblyopia (VA</=0.3) is 2%, reduced to 0.2% after the treatment [19].

With respect to gender, in our study, percentage of amblyopia was more in females (18.9%) than males (14%). Which is consistent with the study conducted by, Seema Sharma *et al.* who found that prevalence of refractive error was 23.7% in girls and only 12.2% in boys [22]. Similar results were found by Tay MT *et al.* in their study on young Singaporeans. They related this high prevalence to the higher rate of growth in girls and also because girls attain puberty earlier than boys [23].

Our results are also consistent with the study conducted by Valeria Mocanu *et al.* Romania which shows 68.8% of the amblyopics in their study were girls [24].

With respect to age of detection of Amblyopia in our study subjects who were screened, majority of the study subjects who were amblyopic belonged to the age of 14 years (33.3%), followed by 16.7% with age of 12 years, 11.1% each with 6, 10 and 13 years of age. Leon *et al.* in his study, showed that older children had increased risk of amblyopia as compared to younger children for moderate anisometropia. These studies emphasize the importance of early vision screening and improving treatment compliance as a result of timely intervention, meaning that the reduction in visual acuity caused by amblyopia can be completely or partially reversed [25]. And also Study conducted by Hussein *et al*., stated that age of six years or older at the onset of Amblyopia, observed that treatment was a risk factor for failure to achieve functional success [26].

Baltimore pediatric eye disease study (BPEDS) showed a slight increase in the prevalence of amblyopia with advancing age whereas a Singaporean Chinese study reported similar prevalence in different age groups [27]. In our study, the most common refractive error found with amblyopia was hypermetropia which contributes about 33.3%, followed by astigmatism and myopia with strabismus (16.7%), myopia with astigmatism or strabismus (11.1%). Hence anisometropic amblyopia secondary to

hypermetropia (55.6%) was more common in our study than anisometropic amblyopia due to myopia followed by meridional and strabismus type of amblyopia which contributes only 22.2% of study subjects. which is consistent with study conducted by Sapkota. K. *et al*. in Nepal and Mohammed A. Rashad *et al.* cairo [28], Egypt The reason for development of amblyopia in anisometropia is a chronically blurred image in one or both eye prevents the normal development of visual acuity. Even after the anisometropia is optically corrected, anisokenia may be another amblyogenic factor for development of amblyopia in them. Severity and prevalence of amblyopia increases as the amount of anisometropia increases [29]. Hypermetropic patients with anisometropia of one Diopter difference may have amblyopia, while myopic anisometropic usually do not have amblyopia until anisometropia is large. whereas in case of meridional amblyopia the mild degree of astigmatism greater than 1.5 Diopter can be amblyogenic.

Our study shows slightly similar report as the, study done by Menon *et al*., amblyopia due to hypermetropia was highest (51.65%). Anisometropia amblyopia [30] was second most common cause of amblyopia which is about 22.1% strabismus amblyopia being 37.38%, followed by ametropic amblyopia 12.88%, and meridional amblyopia was 5.56%.

In our study 14 (77.77%) had unilateral amblyopia and 4 (22.22%) study subjects had bilateral amblyopia**.** Which is similar to the Study done in Nepal eye hospital by Kishore Sapkota *et al.* (71% unilateral amblyopia), in Andhra Pradesh by K Anjaneyulu *et al*., [31] and it is opposite to the study done by Menon *et al*., where 7% cases were bilateral and study done by Chung *et al*., where (49%) amblyopia was bilateral.

Amblyopia is graded as "Mild" amblyopia if the visual acuity being 6/9 to 6/12, "Moderate" amblyopia as visual acuity being worse than 6/12 to 6/36 and "Severe" amblyopia if visual acuity being worse than 6/36.

A higher percentage of mild amblyopia (61.1%) is seen when compared to the moderate amblyopia which is only 38.9% in our study, may be because higher percentage of anisometropic amblyopia was found when compared to meridional amblyopia and strabismic amblyopia.

In our study, Orthotropia was the most common type of gaze found among the screened study subjects (n – 807, 99.3%), followed by exotropia in 4 study subjects (0.5%) and esotropia in 2 cases (0.2%). Among the study subjects who had amblyopia, orthotropia was the most common type of gaze found in 14 study subjects (77.8%).

In contrast to our study, Menon V *et al.* in his study found that amblyopia secondary to strabismus is the most prevalent type of amblyopia (37.88%). This could be because children with apparent pathology, that is, exotropia, esotropia, etc., tend to attend hospitals more frequently than simple refractive errors.

In our study Spectacles was provided to 94 (85.5%) of the study subjects who had diminished vision, of which 2 (11.1%) had amblyopia. 16 (14.5%) were treated with both spectacles and patch, of which 16 (88.9%) had amblyopia.

Conclusion

Screening programs in school children would detect not only amblyopia, but also the other amblyogenic factors like ametropias, strabismus and visual deprivation, the diagnosis and treatment of which in time will prevent amblyopia and subsequent visual loss.

References

1. Davis AR, Sloper JJ, Neveu MM, Hogg CR, Morgan MJ, Holder GE. Differential changes in color and motion onset visual evoked potentials from both eyes in early and late onset srabismic amblyopia. invest ophthalmol vis sci 2008;49(10);4418-4426.
2. Hakim OH, Wright KW. Treatment of anisometropic amblyopia with minimal or no patching. Abstracts Program #2148. ARVO, May/Ft. Lauderdale, FL. 2001.
3. Calcutt C, Murray AND. Untreated essential infantile esotropia: Factors affecting the development of amblyopia. Eye 1998;12:167.
4. Enoch JM. Use of inverted telescopic corrections incorporating soft contact lenses in the (partial) correction of aniseikonia in cases of unilateral aphakia. Adv Ophthalmol 1976;32:54.
5. Hardesty HH. Occlusion amblyopia case reports. Arch Ophthalmol 1959;62:314.
6. Harms H. Ort und Wesen der Bildhemmung bei Schielenden. Graefes Arch Clin Exp Ophthalmol 1938;138:149.
7. Martin G. The ´orie et clinic the amblyopic astigmatism. And Opthalmol 1890;104:101.
8. Noorden GK Von. Classification of amblyopia. Am J Ophthalmol 1967;63:238.
9. Mimura O, Inui T, Kani K, Ohmi E. Retinal sensitivity and spatial summation in amblyopia. Jpn J Ophthalmol 1984;28:389.
10. Mohindra I, Held R, Gwiazda J, Brill S. Astigmatism in infants. Science 1978;202:329.
11. Flynn JT, Amblyopia, revisited. (17th, annual, costenbader, Lecture) J. Pediatr. Ophthalmol. strab 1991;28:183.
12. Wald G, Burian HM. The dissociation of form vision and light perception in strabismic amblyopia. Am J Ophthalmol 1944;27:950.
13. Noorden GK Von, Crawford MLJ. The lateral geniculate nucleus in human strabismic amblyopia. Invest Ophthalmol Vis Sci 1992;33:2729.
14. Baumgartner G. Indirekte Gro ¨ssenbestimmung der rezeptiven Felder der Retina beim Menschen mittels der Hermannschen Gitterta ¨uschung. Pflugers Arch 1962;272:24.
15. Ingram RM, Traynar MJ, Walker C, Wilson JM. Screening for refractive errors at age one year: A pilot study. Br J Ophthalmol 1979;63:243.
16. Flynn JT. Amblyopia revisited (17th Annual Costenbader Lecture). J Pediatr Ophthalmol Strabismus 1991;28:183.
17. Kelly SL, Buckingham TJ. Movement hyperacuity in childhood amblyopia. Br J Ophthalmol 1998;82:991.
18. Pugh M. Visual distortion in amblyopia. Br J Ophthalmol 1958;42:449.
19. Junghardt A, Wildberger H, Neetens A, Ende P Van Dem. Subjective critical flicker fusion (CFF) helps to separate amblyopia from organic disease. Neuro Ophthalmology 1994;14:199.
20. Firth AY. Pupillary responses in amblyopia. Br J Ophthalmol 1990;74:676.
21. Awaya S, Tanabe S, Ueda W. On visual acuity of amblyopic eye under binocular condition. (1) Anisometropic, hypermetropic, amblyopia. Acta, Soc, Ophthalmol Jpn 1968;72:535.
22. Lawwill T. Local adaptation in functional amblyopia. Am J Ophthalmol 1968;65:903.

23. Cole RBW. The problems of unilateral amblyopia. A preliminary study of 10,000 national health patients. BMJ 1 (5116):202, 1959.
24. Frezzotti, R, Nucci E. Osservazioni, elettroretinogray, ambliopia. G Ital Oftalmo 1958;11:199.
25. Williams C, Papakostopoulos D. Electro-oculographic abnormalities in amblyopia. Br J Ophthalmol 1995;79:218.
26. Donahue SP, Wall M, Kutzko KE, Kardon RH. Automated perimetry in amblyopia: A generalized depression. Am J Ophthalmol 1999;127:312.
27. Parsons-Smith G. Activity of the cerebral cortex in amblyopia. Br J Ophthalmol 1953;37:424.
28. Fendick M, Westheimer G. Effects of practice and the separation of tests targets on foveal and peripheral stereoacuity. vision research 1983;23:145-50.
29. "Eye, human. "Encyclopaedia Britannica 2008. Encyclopaedia Britannica 2006 ultimate Reference suite DVD
30. Von Noorden GK, Burian HM. Visual acuity in normal and amblyopic patients under reduced illumination. AMA archives of ophthalmology 1959;61(4):533-5.
31. Mann V Chen AM, Tarczy-Hornoch K, Cotter SA, Candy TR, Accomodative performance of children with unilateral amblyopia. invest Ophthalmol vis sci 2015;56:1193-1207.