Prevalence of Amblyopia Amongst children Presenting in a Tertiary Care Center in Karachi

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Purpose: To determine the prevalence and causes of Amblyopia amongst children presenting to the OPD department of Dow University of Health Science, Karachi, Pakistan.

Study Design: Cross sectional study.

Place and Duration of Study: Eye OPD of Dow University of Health Science (Ohja campus), Karachi, Pakistan from January 2016 to June 2016.

Material and Methods: This was a cross sectional study conducted in the eye OPD of Dow University of Health Science, Karachi, Pakistan. All children aged 5 to 20 years were examined. They underwent visual acuity assessment with Snellen acuity chart. Those with visual acuity less than or equal to 6l9 or having a difference of two lines on Snellens Chart between the two eyes were examined further with cycloplegic refraction with cyclopentolate 1% and dilated fundo exam was performed. Further tests included Hirschberg light reflex test, cover test, prism cover-uncover and extraocular movements.

Results: A total of 2500 children were screened and 169 (6.7%) were found to be amblyopic. There were 61 (36.1%) males and 108 (63.9%) females. Amblyopia was most commonly seen in the age group less than 12 years 63 (37.3%) and the most common cause of amblyopia was isometropia 61 (36.1%) followed by meridional 45 (36.6% mixed 42 (24.9%), anisometropia 15 (8.8%) and squint 6 (3.6%). The prevalence of amblyopia among was found children presenting to the OPD of Dow University of Health Science was found to be 6.7% which is higher than any other published studies on amblyopia.

Conclusion: Screening for amblyopia is essential in all children aged 5 years or more, presenting to outpatient.

Key Words: Amblyopia, Screening, Strabismus, Prevalence.

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A definition of amblyopia according to Friendly is "Amblyopia is a reduction in the quality of central, corrected vision resulting from the disturbance in retinal image formation during the first decade of human life'[1]. The estimated prevalence of amblyopia in different parts of the world is 1.6 to 3.6%[2]. It is one of the major causes of visual disability in children and is usually seen in early childhood[3].

Five major causes of amblyopia Include:

Isometropic amblyopia: When the refractive error in the two eyes exceeded or equaled to 5.0D. Anisometropic amblyopia: When there is a difference of refractive error in both eyes of ≥ 1D of astigmatisim, ≥ 2D of hypermetropia and ≥ 4D of myopia. Strabismic amblyopia: This was defined as amblyopia present in an eye that had constant manifest strabismus. Meridional amblyopia: When amblyopia was as a

result of astigmatism of ≥ 2.00D in one or both eyes. Mixed amblyopia: It is said to occur when more than one cause of amblyopia is present in a single eye[4].

The prevalence of amblyopia in United States is stated to be 1-4% studied by Doshi et al who further stated that only 20% of school going children have visual screening and if amblyogenic factors such as uncorrected refractive error and strabismus were identified and treated early the risk of amblyopia would decrease[5].

Several studies have investigated the prevalence of amblyopia such as a study conducted in Australia in children aged 6 years stated it to be 1.8% while another study done on British children aged 7 years in the Avon Longitudinal Study of Parents and Children estimated it to be 3.6%[6,7].

To the best of our knowledge no similiar study has been conducted in Karachi although another study has been published on the prevalence and risk factors in Lahore Pakistan. The purpose of conducting our study is not only to compare our results to other published studies but also to identify the most common risk factors for amblyopia. There is no proper system of visual screening in school going children and often amblyopia is incidentally discovered in older individuals as they present to the ophthalmologists for other complaints. Visual Screening should be made mandatory in all schools and treatment should commence as early as possible as amblyopia generally develops in childhood years up to 7 to 8 years of age and can be efficiently corrected before 9 to 10 years of age[8,9].

MATERIAL AND METHODS

We recruited patients aged 5 to 20 years from the eye OPD of Dow University of Health Science. There were a total of 2500 children screened of which 900 were boys and 1600 were girls. The patient was initially evaluated by an optometrist who took a detailed history and assessed visual acuity using a Snellens chart. For children who were unable to identify the letters on the Snellen Chart we retested the visual acuity with single letter optotype. Children less than 5 years were excluded because of resistance to examination and poor communication. Any child with a visual acuity of 6l9 or less or with a difference of more than two lines on snellens chart was further investigated by cycloplegic refraction. For cycloplegic refraction we used tropicamide 1% and cyclopentolate 1% instilled five minutes apart every ten minutes for thirty minutes. Both an autorefractometer as well as retinoscopy was done to evaluate the refractive status. Furthermore the patients anterior segment and fundus was examined to rule out any other cause of decreased vision. We also checked the patients extraocular movements and did a comprehensive pupillary exam, and ocular alignment tests such as Hirshberg and cover and uncover which were performed with fixation targets at 0.5m and 4m.

The data was analyzed on IBM SPSS version 22.0 and the results were presented as frequency and percentages for gender, cause, age groups, unilateral or bilateral, and best corrected visual acuity. Mean ± SD was reported for the age variable. Statistical comparisons were performed using Binomial test for proportion for Gender and Unilateral or bilateral variables. Test proportion was 50% and p-value was computed if one of the proportion is higher or lower than 50%. Chi-square goodness of fit test was performed for cause, Best corrected visual acuity and age groups which test proportions of all categories for a specific variable are same or different. Chi-square test was applied to see the association between gender and amblyopia. A p-value of 0.01 or less was considered statistically significant.

RESULTS

In total we screened 2500 subjects of which 169 were found to have amblyopia. females were 108 (63.9%) and Males were 61 (36.1%) which is also significant due to the higher proportion of female reported in Table 01. The average age of the study population was 12.3 years ± 3.6 SD. There are gradually increasing number of subjects in age groups, for less than 12 years 63 (37.3%), most population was found in 12 to 15 group 84 (4%) and relatively less was found in 16 and above age group 22 (13.0%).

Table 1 the statistics for shows etiology. Amongst causes Isometropia was found to account for the highest number of amblyopia patients which were 61 (36.1%). A similar pattern can be observed for best corrected visual acuity.

Patients were more Bilateral 133 (78.7%) them Unilateral 36 (21.3%). Graphically the same was reported and significance reported in the Table 1.

Table 2 Distribution of amblyopia which shows that females were larger in number than males but there was the same proportion of Amblyopia among males 61 (6.8%) and in females 108 (6.8%).

Table 1: Distribution of Patients having Amblyopia.

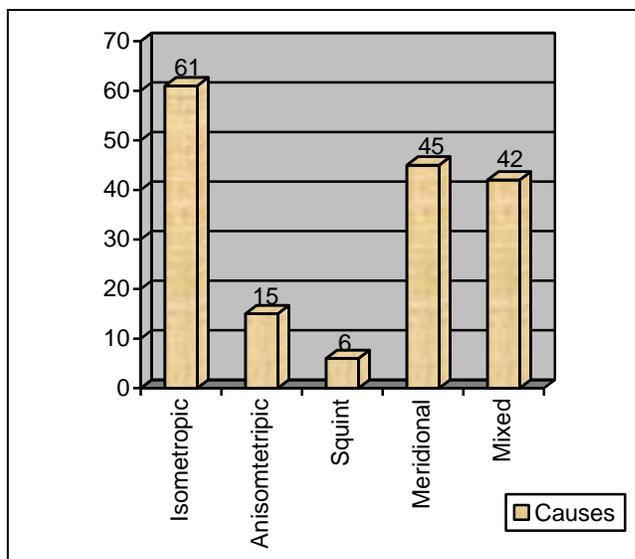| Characteristics ZAS	N = 169	%	P-value
Gender			
Female	108	63.9	< 0.001**
Male	61	36.1	
Age (Mean ± SD = 12.3 ± 3.6)			
<12 years	63	37.3	
12 - 15 years	84	49.7	< 0.001**
16 + years	22	13	
Cause			
Isometropic	61	36.1	
Anisomtetropic	15	8.9	
Squint	6	3.6	< 0.001**
Meridional	45	26.6	
Mixed	42	24.9	
Unilateral or Bilateral			
Bilateral	133	78.7	< 0.001**
Unilateral	36	21.3	
Best corrected visual acuity			
6/9	114	67.5	
6/12	27	16	
6/18	8	4.7	
6/24	9	5.3	< 0.001**
6/36	4	2.4	
6/60 or less	7	4.1	

**Significant at 1%
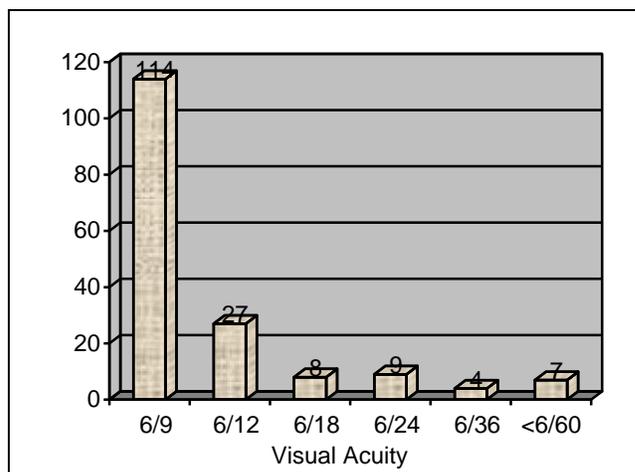

Fig. 1: Distribution of Causes.

Fig. 2: Distribution of Best Corrected Visual Acuity.

DISCUSSION

Pakistan is ranked as the sixth most populated country in the world[10]. A survey done in 2015 stated that the

Table 2: Distribution of Patients of Amblyopia by Gender.

Characteristics	Amblyopia		Total (N = 2500)	P-value
	Yes (N = 169, 6.8%)	No (N = 2331, 93.2%)		
Gender				
Male	61 (06.8%)	839 (93.2%)	900	0.979
Female	108 (06.8%)	1492 (93.3%)	1600	

Pakistani population estimates to more than 191.71 million and a study done on Pakistani population showed the prevalence of blindness to be 0.9%[11]. The total number of blinds will increase to almost double in the year 2020, if the prevalence rate remains the same (1.25 million in 2003 to 2.4 million in 2020)[12]. Throughout the world the leading cause of blindness is cataract and this is seconded by uncorrected refractive error[13]. Uncorrected refractive error leads to amblyopia which is defined as a reduction in corrected visual acuity (VA) in absence of visible organic abnormalities and is due to misdirected, distorted, or absent retinal images during maturity of visual system.[14] It is the most common cause of uniocular visual impairment in both children as well as adults[15]. It can be as a result of strabismus which is deviation of eyes and abnormal inter ocular interaction, or any form of a form vision deprivation e.g. dense corneal or lenticular opacity, high myopias and hyperopias, anisometropia or astigmatism. Early recognition of amblyopia and prompt treatment is necessary to improve or correct the vision in amblyopia. The prognosis is better if treatment of amblyopia is administered latest by 7 – 8 years of life in cases amblyopia of squint and for refractive amblyopias treatment should be instituted maximum by early teens[16].

The prevalence of amblyopia in our study was higher as compared to the figure quoted in other studies. Amblyopia was present in 169 children of the total 2500 children screened thus making a prevalence rate of 6.7%. To our knowledge this is the highest rate ever quoted. This disparity may be explained by the different diagnostic criteria for amblyopia used in various studies some using visual acuity of 6/9 or less while others defining amblyopia as less than or equal to 6/12 on Snellen Chart. Furthermore lack of awareness amongst general population of importance of visual acuity assessment and also poor accessibility of health care centers may be the cause of this high prevalence of amblopia in Karachi, Pakistan. Our prevalence rate of amblyopia is significantly higher when compared to a study done in primary schools in Nigeria which has stated the prevalence rate to be only 0.23%[17]. In another study done in another city of Pakistan the prevalence rate of amblyopia was 3.0%[18] while still another study conducted by Rahi et al showed the prevalence of amblyopia was 4.8%[19].

The number of females having amblyopia 108 (63.9%) were more as compared to amblyopic males 61 (36.1%). This is in contrast to other studies such as the one conducted in Southern India where the number of boys with amblyopia (n = 25, 57%) was slightly higher than the number of girls with amblyopia (n = 19, 43%; p = 0.6)[20], also in China where the male to female ratio was 57 to 42.97%[21]. However a slightly increased preponderance of amblyopia was seen in female subjects as compared to male subjects in a study done in Iran in which 2% of the male students (95% CI: 0.9 – 3.1) and 2.5% in girls (95%CI: 1.5 – 3.6) had amblyopia which is comparable to our results[22]. The number of amblyopic females were more in our study because the total number of females presenting to the OPD of our department were more than males: 1600 female subjects versus 900 male subjects.

The causes of amblyopia in our study included isometropia 61 (36.1%), meridional 45 (26.6%), mixed 42 (24.9%), anisometropia 15 (8.9%) and squint 6 (3.6%). Our results are comparable to a study done in southern India where Underlying amblyogenic causes were ametropia (50%), anisometropia (40.9%), strabismus (6.8%), visual deprivation (4.5%) and combined causes (2.2%)[20]. In a study done on rural chinese population the causes of amblyopia included were anisometropia (67.3%), strabismus (5.4%), mixed strabismus and anisometropia (4.4%), visual deprivation (9.8%), astigmatism association (9.8%), and other (3.4%)[23]. In another study done in Lahore, Pakistan the causes listed were Strabismic amblyopia in 110 (55%), anisometropic amblyopic in 42 (21%), combined mechanism amblyopia in 32 (16%), ammetropia in 12 (6%), and stimulus deprivation in 4 (2%) of the children[24].

In terms of laterality patients in our study are more Bilateral 133 (78.7%) and a very less are unilateral i.e. 36 (21.3%). We also found that there were gradually increasing number of subjects in age groups, For less than 12 years 63 (37.3%), In 12 to 15 group 84 (4%) and in 16 and above age group 22 (13.0%). Sean P conducted a study in which the prevalence was 40% (32/80) for 2-year-olds, 65% (119/182) for 3-year-olds, and peaked at 76% (age 5) showing a steady increase in the prevalence of amblyopia with age[25].

We also see that the best corrected visual acuity gradually decreases from 6/9 to < 6/60 with a significant p-value. Patients having 6/9 corrected visual acuity were 114 (67.5%), 6/12 were 27 (16.0%), 6/18 were 8 (4.7%), 6/24 were 9 (5.3%), 6/36 were 4 (2.4%), ≤ 6/60 were7 (4.1%).

The limitations of this study are that it is a single

center study and children under 5 years were excluded due to poor communication. Further studies should be multicentered and should comprise of a larger sample size for more accurate results.

In Summary we have the highest prevalence rate of Amblyopia i.e. 6.7% as compared to studies conducted in other parts of the world. This high prevalence rate is mostly because there is lack of effective visual screening programs for children. Another reason for this high prevalence rate may be as a result of usage of a lower threshold for the diagnosis of amblyopia used in our study. Nevertheless we feel the government of Pakistan should not only strategize screening programs in all schools but should also facilitate timely treatment to prevent and treat amblyopia. The prevalence of amblyopia among children presenting to the OPD of Dow University of Health Science is determined to be 6.7% which is higher than any other published studies on amblyopia.

CONCLUSION

Screening for amblyopia is essential in all children aged 5 years or more, presenting in the outpatient departments of all hospitals.

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