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Types of amblyopia and treatment outcome in Nepalese children

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尼泊尔儿童弱视种类及治疗结果

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摘要

目的:研究尼泊尔儿童弱视类型以及影响治疗结果的相关因素。

方法:该研究为以医院为基础的回顾性研究。对 2009-06/2011-06 注册登记的 257 名弱视儿童的诊断记录进行了回顾性分析。弱视的类型分为屈光参差性、双眼屈光不正性、斜视性和混合性弱视。双眼屈光不正性弱视儿童单独给予戴镜治疗,斜视性弱视每天给予 6h 遮盖治疗,屈光参差性和混合性弱视根据需要给予遮盖和光学矫正。主要检测为术后视力,并分析就诊时的年龄、弱视类型、初始视力以及屈光不正的类型和严重程度对最终视力的影响。

结果:儿童年龄范围为 3~15(平均 7.96±3.09)岁。双眼屈光不正性弱视为最常见类型(35.8%),其余依次为斜视性弱视(31.9%),屈光参差性为 23.0%,混合性弱视为 9.3%。双眼屈光不正性弱视的平均最终视力(0.295±0.25)比其他类型的要好(logMAR 视力检测,P = 0.001)。最终视力与就诊年龄、屈光不正的类型和严重程度没有显著的相关性(P 值分别为 0.98,P=0.12),但是最终视力与就诊时初始视力有显著相关性(P=0.00)。

结论:双眼屈光不正性弱视为最常见的,术后视力也是最好的、最初的视力是成功治疗弱视的最重要因素。

关键词:弱视;双眼屈光不正性弱视;尼泊尔

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Abstract

• AIM: To study the pattern of amblyopia and factors responsible for treatment outcome in Nepalese children.

• METHODS: It was a hospital based retrospective study. The medical records of 257 children registered from June 2009 to June 2011 with the diagnosis of amblyopia were reviewed retrospectively. Types of amblyopia studied were anisometropic, isoametropic, strabismic and the mixed amblyopia. Children with isoametropic amblyopia were treated with glass alone, strabismic amblyopia with patching of 6 hours a day, anisometropic and mixed amblyopes were given patching and optical correction both according to the need. The main outcome measure was the visual acuity at the end of treatment. The age at presentation, type of amblyopia, initial visual acuity, type and severity of refractive error, were the factors analyzed for their effect on final visual outcome.

• RESULTS: The mean age of children was (7.96±3.093) years with the age range from 3 to 15 years. Isoametropic amblyopia was the most common type (35.8%), followed by the strabismic amblyopia (31.9%), anisometropic (23.0%) and the mixed type (9.3%). The mean final visual outcome was better in isoametropic amblyopia (LogMAR 0.295±0.25) than in other types (P=0.001). There was no significant correlation between the visual acuity outcome and the age at presentation (P=0.98), type and severity of refractive error (P=0.12). However the presenting visual acuity had a significant correlation with the final visual outcome (P=0.00).

• CONCLUSION: Isoametropic amblyopia was the most common type of amblyopia and with the best visual outcome. The initial visual acuity was the most important factor determining success of amblyopia treatment.

• KEYWORDS: amblyopia; isoametropic amblyopia; Nepal
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INTRODUCTION

Amblyopia is one of the most common causes of vision impairment both in young children and adults. The prevalence of amblyopia ranges from 0.2% to 5%, according to different subsets of population[1-8]. It may be defined as unilateral or less commonly bilateral decrease in vision without any apparent organic pathology. The causes of amblyopia include anisometropia, high refractive error, strabismus, stimulus deprivation. Whatever may be the cause, the basic mechanism of form visual deprivation in one or the other eye or the abnormal binocular interaction between the two eyes remain same in all types of amblyopia[9-11]. Though strabismic amblyopia is considered as the most common, some studies have shown the anisometropic amblyopia more common than the strabismic in the school age children[12,13]. There is a widely accepted fact that amblyopia can be treated effectively if diagnosed earlier. Within the age of 6-7 years, the

treatment of amblyopia has been found to be effective. However some studies have shown good results in older children as well[14-17]. The treatment of amblyopia includes optical correction, patching and penalization depending upon the type and severity. Good treatment outcome in amblyopia depends on many factors, including type of amblyopia, age at onset of treatment and compliance[18-21]. We did a retrospective review of the medical records of children to find out the types of amblyopia and the factors affecting treatment outcome.

SUBJECTS AND METHODS

Subjects The study was a retrospective review of medical records of children with amblyopia. All the diagnosed cases of anisometropic, isoametropic, mixed and strabismic amblyopia were included in the study. Children with stimulus deprivation amblyopia were excluded from the study. Because we could not retrieve detail data on these children and the treatment protocol was different than the other types of amblyopia. The protocol of the study was approved by the institutional review board of Tilganga Institute of Ophthalmology. The study conforms to the declaration of Helsinki in 1995 (As revised in Edinburg 2000.)

Methods

Definition of amblyopia 1) The inter ocular difference of visual acuity of two lines or more; 2) Best-corrected visual acuity (BCVA) of less than 6/9 either in one or in both the eyes in the presence of refractive error and the strabismus.

Anisometropic amblyopia The patients who had amblyopia in the presences of anisometropia of 1D of spherical equivalence or the 1.5D of astigmatistm.

Mixed amblyopia The patients who have amblyopia in the presence of both anisometropia and the strabismus.

Ametropic amblyopia If there's is amblyopia in both the eyes with the spherical equivalence of refractive error of more than 1D.

The severity of refractive error was graded as mild, moderate and severe. Mild: When myopia and hyperopia of up to 2D spherical equivalence, astigmatism of 1D. Moderate: Hyperopia and myopia of >2D to 5D spherical equivalence, and astigmatism > 1D to 3D. High refractive error when myopia and hyperopia of >5D spherical equivalence and the astigmatism of more than 3.

All the children underwent visual acuity examination. In small children (3-5 years old) the visual acuity was measured using the Sherrington Gardiner (SG) chart at three meters distance. In older children, visual acuity examination was done by Snellen's acuity chart kept at 6 meter distance. The anterior segment examination was done by using slit lamp. Posterior segment examination was done by using the indirect Ophthalmooscope. Ocular motility examination, test for ocular alignment, the cycloplegic refraction with the post mydriatic test after 3 days was done in all the children. Cyclopentolate 1% was used as cycloplegic agent. Children with isoametropic amblyopia were treated only with the glass correction. Children with strabismic amblyopia were given the treatment of 6 hours of daily patching with at least one hour of active vision therapy. The anisometropic and mixed amblyopia was corrected with patching along with glass correction according to the need. All the children were followed up every 3 months.

Table 1 Distribution of mean age and the presenting visual acuity in children with different types of amblyopia

Amblyopia type	n(%)	Age($\bar{x}\pm s$, a)	Mean BCVA VA (LogMAR, SD)
Aniso-	59(23.0)	8.10±3.094)	0.854(0.3186)
Iso-	92(35.8)	7.40±2.722)	0.716(0.2628)
Mixed	24(9.3)	8.21±2.604)	0.996(0.3629)
Strabismic	81(31.9)	8.43±3.538)	0.916(0.3526)
Total	257(100)	7.96±3.093)	0.838(0.3292)

Statistical Analysis The Snellen visual acuity was converted to logMAR for the analysis purpose. The data was collected in the Microsot Excel and were analyzed using SPSS software version 16.5. The Pearson correlation test, analysis of variance and multiple regression analysis was done as the statistical method. The results were presumed to be significant at the level of $P<0.05$.

RESULTS

A total of 257 children with the diagnosis of amblyopia were included in the study. The types of amblyopia wereanisometropic, strabismic, isoametropic and the mixed amblyopia. The age of children ranged from 3 to 15 years, with the mean age of 7.96 years (±3.093 years). There were 35.4% ($n=91$) female and 64.6% ($n=166$) children were male. Isoametropic amblyopia was the most common type accounting for the 35.8% ($n=92$) followed by strabismic amblyopia, 31.9% ($n=81$); Anisometropic amblyopia, 23.0% ($n=59$) and the mixed amblyopia, 9.3% ($n=24$). The most common type of strabismus was esotropia found in 40.0% of children followed by exotropia and hypertropia. There were 21.0% ($n=54$) of children who did not show up for the follow up examination.

Baseline visual acuity, age at presentation, amblyopia type, type and severity of refractive error At the time of presentation, the children with isoametropic amblyopia had the better visual acuity than in the other types ($P=0.003$). The mean age at the time of presentation in the isoametropic amblyopia was less than the other types but this relationship was not statistically significant ($P=0.316$). When we analyzed the relationship between the age at presentation and the presenting visual acuity there was no significant relationship between the two ($P=0.063$, Table 1). Hypermetropia was the most common refractive error found in children with amblyopia. Moderate hypermetropia (43.8%) was the most common type of refractive error found in the isometropic amblyopia ($P=0.001$).

Factors affecting final visual acuity There were 21% of children lost in the follow up. After excluding those children, a total of 203 (257-54) were included for the analysis of final visual acuity and its association. There was a strong correlation between the types of amblyopia and the final visual outcome, with isoametropic amblyopia having the best visual

Table 2 The Post treatment visual outcome compared according to types of amblyopia, age group and severity of refractive error.

Amblyopia Types	Posttreatment best-corrected visual acuity[1] *n* (%)						Total	*P*
	0.0	0.2	0.3-0.5	0.6-1	1.1-1.3	1.4-1.5		
Aniso	8(16.23)	8(16.23)	15(30.61)	17(34.69)	1(2)	0(0)	49	0.001
Isoametropic	21(26.25)	20(25)	26(32.5)	13(16.25)	0(0)	0(0)	80	
Mixed	0(0)	3(13.63)	6(27.2)	10(45.45)	1(4)	2(9)	22	
Strabismic	3(5.7)	8(15.38)	19(36.53)	18(34.61)	2(3.84)	2(3.84)	52	
Age in years(At presentation)								0.98
3-7	20(17.69)	22(19.46)	38(33.62)	31(27.43)	1(10.8)	1(10.8)	113	
8-11	9(14.51)	13(20.96)	19(30.64)	17(26.56)	1(1.56)	3(4.83)	62	
12-15	3(10.71)	4(14.28)	9(32.14)	10(35.71)	2(71.42)	0	28	
Total	32(15.76)	39(19.21)	66(32.51)	58(28.57)	4(1.9)	4(1.9)	203	
Severity of refractive error								0.128
Mild	5(20)	9(36)	8(32)	3(12)	0	0	25	
Moderate	18(16.21)	27(24.32)	32(28.82)	30(27.07)	22(7.07)	2(1.8)	111	
Severe	7(21.21)	1(3.03)	15(45.45)	10(30.30)	0	0	33	
Total	30(17.75)	37(21.89)	55(32.54)	43(25.54)	2(1.18)	2(1.18)	169	

[1]LogMAR equivalent visual acuity shown in the bracket.

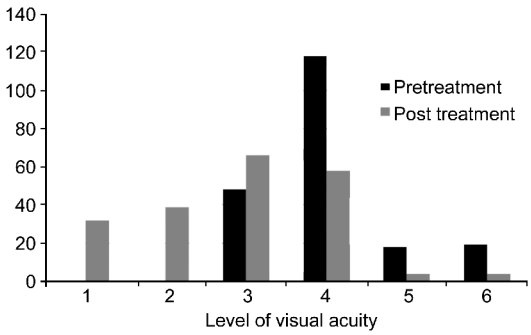

Figure 1 Relationship between the initial visual acuity and the final visual acuity after the treatment. 1=6/6, 2=6/9, 3=6/12-6/18, 4=<6/18 - 6/60, 5=,6/60-3/60, 6=<3/60-1/60.

Table 3 The post treatment visual outcome in children with the presenting visual acuity less than LogMAR 1.0 (6/60)

Visual acuity in LogMar (Snellen's)	Pretreatment *n*(%)	Post treatment *n*(%)
1.1-1.3 (<6/60-3/60)	18(8.86)	4(1.97)
1.4-1.5 (<3/60-1/60)	19(9.35)	4(1.97)
Total	37(18.22)	8(3.94)

outcome. (P=0.001). The relationship between final visual acuity with the type of amblyopia, age at presentation and type and severity of refractive error were shown in Table 2. However there was no significant relationship between the age of the child (P=0.98), the severity of refractive error (P=0.128). We found that there was significant relationship between the presenting and the final visual acuity. (P=0.000). The relationship between the presenting visual acuity and the final visual acuity were shown in Figure 1. While analyzing the children with poor visual acuity, there were 18.22% of children who had visual acuity of less than 6/60 at the time of presentation. After the treatment, only 3.94% of children had vision less than 6/60, out of which, 3 children were in the Isoametropic group with decrease vision in both the eyes (Table 3).

DISCUSSION

Amblyopia is one of the major public health issues both in children and adults. Prevalence of amblyopia ranges from 0.2%-5% worldwide. However there is lack of published data in Nepal showing the prevalence of amblyopia. Also, there's no reported hospital based studies covering the different aspects of amblyopia. Though this study is a hospital based study, this represents a wide range of pediatric population of Nepal. Our hospital is a tertiary referral hospital. So we have patients from all over the country. One of the important findings of this study is the delayed presentation of children to hospital. The most common age group in the study was from 6 to 8 years. This shows the lack of awareness among people about timely vision screening. We know that, one of the important factors in good outcome of the amblyopia treatment is the early intervention. As the age advances, the treatment becomes less effective[9-11,22]. In our study, we found isoametropic amblyopia to be the most common type of amblyopia contrary to the other studies in which strabismic amblyopia is the most common type[8,18,23-26]. This may be because of the fact that children were brought to hospital only when there's vision blur in both the eyes and difficulty in reading. Otherwise, the anisometropic amblyopia usually goes unnoticed. The reason for strabismic amblyopia be the less common type may be because of the fact that, in our society, there is a common belief that strabismus is a sign of good luck, So people don't consider it as a disease condition. This also reflects lack of awareness about eye disease in our society. The mean age at presentation to hospital is also less in isoametropic amblyopia than the rest of the others. However this is not statistically significant. In study from India and the PEDIG (Pediatric Eye Disease Investigator Group) study, the strabismic amblyoia children were of younger age group[8,23]. The age group however was comparable with our children in the study done by V Menon in India[23]. The presenting or base line visual acuity in the

isoametropic amblyopia was better than in the other groups which was statistically significant (0. 003). This was in contrary to the studies done in India and the PEDIG study[8,23]. There was no statistically significant association with the age of presentation and the baseline visual acuity in these children. We analyzed the type and severity of refractive error. Moderate refractive error was the most common type of refractive error. There was significant association with the type and severity of refractive error and the amblyopia type, which was in contrast to the PEDIG study and study done in India. Visual outcome after the treatment was better in the Isoametropic amblyopia in our study which is also contrary to the other studies done by Arikan and Lee *et al*[16-18]. We did not find any strong relationship between the age of the presentation and the final visual outcome. Beardsell *et al*[27] and Woodruff *et al*[22] did not found any relationship, However, Arikan *et al*[18] found the relationship between the age and the final visual outcome. We found a strong correlation between the initial and the final visual acuity with children having less initial visual acuity showed less improvement in the final visual acuity. This is in accordance with the other studies in the literature[22,27-29]. In our study 35% of children achieved the final visual acuity of 6/9 or better, and 68% with vision 6/18 or better. This is similar to the studies done by Arikan[18], Woodruff[22], Beardself[27] and Flynn *et al*[28]. We did not find any significant relationship between the type and severity of refractive error and the final visual outcome. However, the studies done in Turkey and India, found the positive relationship[25,26]. The main limitation of our study is that it was a retrospective study. Also we did not measure the compliance of patching therapy as it can be one of the important factors contributing to the final visual outcome.

In conclusion we can say that amblyopia can be treated effectively if timely detection is done. The constant vision blur in both the eye was one of the important causes of amblyopia in the Nepalese children. The initial presenting vision is an important factor predicting the final visual acuity in children.

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