Original Research Article

Profile of amblyopia in children of age 5 to 15 years at tertiary care center in Kumaon region, Uttarakhand

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Abstract

Background and objectives: Amblyopia is one of the major causes of visual impairment in children. Early treatment and diagnosis of amblyopia can have a considerable impact on quality of life of children .This cross sectional study was done to study the profile of amblyopia. **Methods**: 3963 children were evaluated for amblyopia at tertiary care center of Kumaonregion from 1 January 2019 to 30 September 2020.Evaluation included assessment of best corrected visual acuity(BCVA),refractive status of both eyes,laterality of amblyopia, age of presentation,history of previous treatment,type of deviation and type of amblyopia.**Results:** 148 eyes of 103 patients were found amblyopic. Average age of presentation was 10.04± 3.248 years with 75 patients (72.9%) above 8 years. Majority of patients i.e. (55/103,53.4%) had not taken any previous treatment for amblyopia. Most of the children i.e. 40(38.8%) had anisometropic amblyopia Unilateral amblyopia was present in 58 children (56.30%) in our study. In 148 amblyopic eyes, astigmatism was the most common refractive error (72.3 %) and least was myopia (8.80%).24 patients (23.3%) were strabismic.**Interpretation & Conclusion:** Majority of patients with amblyopia presented late with significant number presenting without any history of previous treatment. Anisometropic amblyopia was present in large proportion of patients as well as in those who presented in later ages.Thus, it demands an urgent need to take steps to increase awareness among parents and to perform screening in children to detect large uncorrected refractive errors which if not corrected timely can cause irreversible vision loss.

Keywords:Amblyopia,Anisometropic amblyopia,strabismic,uncorrected refractive errors.

Introduction

Amblyopia is one of the major causes of visual impairment in children.[1] Amblyopia is defined as reduction of visual acuity in one or both eyes below 6/12 or difference of two Snellen lines between two eyes with absence of any ocular abnormality that does not improve by refraction.[6] Amblyopia is caused either due to abnormal binocular interaction or form vision deprivation.[2,3,4]As per various studies conducted in India, prevalence rate of amblyopia ranges from 0.8 to 3.3 %.[5,6]Based on aetiology,amblyopia is divided into strabismic,anisometropic,combined,isometropic and visual deprivation amblyopia.[8]Inputs that are not fusible in eyes with strabismus or lack of visual stimulus in eyes with deprivation or change in the sharpness of image as in anisometropia,isometropia or combination of one or both, causes partial disconnection of affected eye, resulting into amblyopia.[2-4]In early age visual system has increased sensitivity to stimuli present in environment and its correct formation is based on sensory experience.Time of onset,degree, duration and type of disturbance in vision determine the impact on neural circuits.Increased neuroplasticity in young age increases the chance of reversal of amblyopia.[7] Therefore, amblyopia when diagnosed beyond critical period (> 8 yrs),become less responsive to treatment.[2,3,4] This emphasises the need for early diagnosis and treatment of this correctable conditionAmblyopia causes defective binocular vision,reduction in contrast sensitivity,fine and gross motor skills as well as ocular motor,visual defects in other non amblyopic eye.[9-11] Presence of amblyopia increases the risk of bilateral visual impairment.[12] Reduction in visual acuity can become permanent if timely intervention is not taken. Irreversible visual impairment caused by amblyopia in a person causes low self esteem, increased fear of losing vision in fellow eye and less career options. [11,14,15]Amblyopia also affects social interaction, with effect on activities and education which affect self image and self esteem, therefore it has a great impact on health related quality of life. [13] Treatment of amblyopia involves patching, optical correction of significant refractive errors, pharmacological treatment and other alternate therapy.[16]Majority of children under 7 years of age with moderate degree of amblyopia in a study by Paediatric Eye Disease Investigator Group (PEDIG) showed improvement in vision after initiating treatment.[17] Amblyopia prevention requires timely correction of refractive errors and deviation of eyes.Early search for contributing factors with widespread increase in awareness among parents is essential for timely initiation of treatment and can significantly,decrease morbidity caused by amblyopia. In our study, we prospectively analysed the profile of amblyopia in children of the age group between 5 to 15 years, at tertiary care centre of Kumaon region of Uttarakhand from 1 January 2019 to 30 September 2020.

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Material and methods

This cross sectional study was conducted in Out Patient Department of Ophthalmology in which 3963 children of age 5 to 15 years were evaluated for amblyopia at tertiary care center of Kumaon region from 1 January 2019 to 30 September 2020. Detailed history of patients was taken.Patients with amblyopia of age group 5 to 15 years were included.Older patients > 15 years of age, younger patients <5 years of age and patients having sensory deprivation amblyopia (documented cause of sensory deprivation that include media opacities, ptosis, etc) were excluded. Detailed history of patients was taken and visual acuity was assessed by Snellen chart. Slit lamp examination was done for anterior segment assessment. Cycloplegic refraction by streak retinoscope and subjective correction (3 days later)was done in patients with difference in the best-corrected visual acuity (BCVA) between the two eyes of two or more Snellen lines or when best corrected visual acuity (BCVA) was less than 6/12 bilaterally. Eye drop Homatropine (2%) was used for cycloplegia.Ocular alignment and fixation with assessment of extraocular movements . Fundus examination was done by indirect ophthalmoscope. Assessment of the binocular status of the eye was performed with the help of the Worth's four-dot test and Bagolini's striated glasses.

Amblyopia was defined as[8,18]

1.A difference in the best-corrected visual acuity (BCVA) between the two eyes of two or more Snellen lines in the absence of any organic lesion that could result in a decrease in vision.

2. A best corrected visual acuity (BCVA) of less than 6/12 bilaterally on the Snellen's chart in the absence of any organic lesion that could result in a decrease in vision.

Strabismic amblyopia:This was defined as amblyopia in the presence of a heterotropia at distance or near fixation in the absence of any anisometropia meeting the criteria for a combined mechanism amblyopia.[8,18]

Anisometropic amblyopia: This group included patients who have amblyopia in the presence of anisometropia that is greater than 1.50 diopters (D) of anisohyperopia, 2.00 D of anisoastigmatism and 3.00 D of anisomyopia resulting in a decrease in vision in one or both eyes.[8,18]

Combined amblyopia: This group included patients with either a heterotropia at distance or near along with anisometropia that is greater than 1.50 diopters(D) of anisohyperopia,2.00 D of aniso-astigmatism and 3.00 D of anisomyopia between both the eyes. [8,18]

Isoametropic amblyopia:This group included patients with refractive errors more than 3 D myopia, 4.5 D hyperopia,2.00 D astigmatism in both eyes resulting in subnormal vision in one or both eyes and no associated strabismus or any other ocular pathology. [8,18]

Sensory deprivation amblyopia: This group included patients with a known documented cause of sensory deprivation with no primary heterotropias or refractive errors that could be causally related to the amblyopia (include media opacities, ptosis, etc).[8,18]

Statistical Analysis

Data was compiled and entered in MS excel sheet and analysis was carried out using Statistical Package for Social Services (IBM SPSS version 26) for windows. Analysis was performed by descriptive statistical analysis using ratio and proportions and Chi-square test for categorical variables.

Results

Out of 3963 patients,148 eyes of 103 patients were found amblyopic. Average age of presentation was 10.04± 3.248 years.The majority of patients i.e.75 (72.9%) presented were above 8 years. (Table 1).

Table 1:Distribution of patients according to age group

Age Group (in years)	Number of patients	Percentage (%)
5-7 years	28	27.2%
8-10 years	32	31.1%
11-13 years	21	20.4%
14-15 years	22	21.4%

55 patients (53.4%) of total 103 patients were male and 48 patients (46.6%) were female, thus male to female ratio was found to be 1.14:1.Majority of patients i.e. 55 (53.4%) had not taken any previous treatment for amblyopia.(Table 2)

Table 2:Distribution of patients according to history of previous treatment

History of previous treatment	Number of Patients	Percentage (%)
Absent	55	53.4
Present	48	46.6
Total	103	100.0

148 eyes of 103 patients were amblyopic. Majority of patients i.e. 58 (56.3%) had unilateral amblyopia .45 patients (43.7%) had bilateral amblyopia. Among 58 patients with unilateral amblyopia, right eye was affected more than left eye. Right eye was affected in 31 patients (30.1%) and left eye was affected in 27 patients (26.2%).Most of the children i.e. 40(38.8%) had anisometropic amblyopia followed by isometropic in 39 children (37.9 %) and strabismic amblyopia in 15 children (14.6%). Only 9 patients(8.7%) had combined amblyopia. (Fig.1)Anisometropic amblyopia was the most common type of amblyopia in our study.

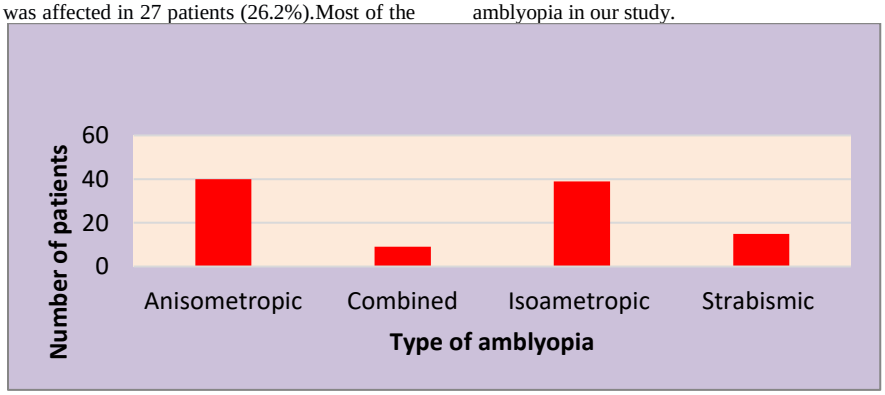

Fig 1:Distribution of type of amblyopia in patients with amblyopia

Hypermetropic astigmatism was the most common refractive error in amblyopic eyes.(Table 3) Out of 103 patients, 24 patients had strabismus with esotropia present in 15 patients (62.5%) and exotropia present in 9 patients (37.5%), showing esotropia to be more common than exotropia in our study. 24 patients had strabismus. Among these, 9 patients had combined amblyopia and 15 patients had strabismic amblyopia.Major proportion of patients presenting with strabismus, were in the age group 5-7 years.

Table 3:Distribution of refractive errors in amblyopic eyes.

Refractive Errors	Number of amblyopic eyes	Percentage (%)
Hypermetropia	28	18.9
Hypermetropic Astigmatism	57	38.5
Myopia	13	8.8
Myopic Astigmatism	50	33.8
Total	148	100.0

Discussion

Amblyopia causes decrease in vision without any ocular abnormality. Strabismus, unequal refractive errors (anisometropia) or combination of both, deprivation of visual stimulus and high refractive errors (isoametropia), when present in a child in early phase of life causes amblyopia. Early recognition of this visual impairment in children, before the critical age i.e. 8 years as suggested in many studies improve visual prognosis. However treatment can be started even after 8 years but the outcome is not so favourable.[19-21] Knowing the contribution of each type of amblyopia for the causation of visual impairment helps in formulating an effective strategy to enhance visual prognosis as well as prevent irreversible visual impairment.In our study, 3963 children within the age group 5 to 15 years were screened, out of which, 148 eyes of 103 patients were found to be amblyopic.The average age of presentation was 10.04 ± 3.248 years in our study, in which majority of patients i.e. 75(72.9%) were above 8 years which is higher than the average age seen in the studies done by Al Haddad et al. in Lebnan[22] (6.2 ± 6.1 years), Menon et al. (7.97±6.18 years) in India.[23] However our findings are consistent with the studies done by Saxena et al.[24] (16.1 ± 14 years), Bhandari et al.[25] (9.3±3.9 years) in Nepal. The majority of patients i.e.75 (72.9%) presented were above 8 years.Late age of presentation in our study demands urgent need to do screening of children in population and schools and increase awareness among parents about amblyopia. Patients with isometropic amblyopia were seen more commonly between ages of 5 to 10 years, while those with anisometropic amblyopia, presented more commonly in the later age group i.e. between 11 to 15 years. This shows that patients with unilateral amblyopia remained undetected till a later age.Average age of presentation in males was 10.55±3.321 years and in females was 9.46 ±3.094 years respectively.The difference in the distribution of patients of different ages with respect to the specific subtype of amblyopia was however not statistically significant.

Gender distribution

In our study, there were 55 male (53.4%) and 48 female (46.6%) amblyopic patients with male to female ratio of 1.1:1 and the p value was insignificant (p>0.05). Many studies like, Marthala et al.[26] and Gupta et al. [27] found higher proportion of male patients with amblyopia than female, for which they explained that, fewer girls reported.However, this gender preference was not significant in our study.

Distribution of amblyopia

In our study, most of the children had anisometropic amblyopia i.e. 40 (38.8%) followed by isoametropic 39 (37.9 %) and strabismic amblyopia 15(14.6%).

Only 9 patients (8.7%) had combined amblyopia. Anisometropic amblyopia was present in the largest proportion in Indian studies done in Wardha[28], Assam[29], Nagpur [30] as well as in international studies done in South China [34] and Pakistan.[35]

Higher proportion of patients with refractive amblyopia (anisometropic and isoametropic amblyopia) is supported by many studies showing uncorrected refractive errors as one of the major cause of visual impairment.[31-33]Few other studies done in India i.e. Menon et al. [23] in Delhi,Marthala et al.[26] in Karnataka and Al Haddad et al.[22] in Lebnan and Woodruff et al.in U.K.[37] had greater proportion of children with strabismic amblyopia.On the contrary,uncorrected refractive error was the major cause of amblyopia in our study.

Laterality of amblyopia

In our study, 58 children (56.30%) had unilateral amblyopia and 45 children (43.7%) had bilateral amblyopia which shows that unilateral amblyopia was more common. Studies done in Karnataka by Marthala et al.[26] and in Delhi by Menon et al.[23] had similar finding. However studies done in Assam by Magdalene et al.[29], in Dehradun by Gupta et al.[27]had bilateral amblyopia, more common than unilateral amblyopia.There was no history of prior treatment in 55 children (53.4%). Significant number of children presenting above 14 years of age had no history of previous treatment. This shows that, unilaterality and lack of awareness among parents for screening programmes is responsible for delay in diagnosis of amblyopia.

Distribution of refractive errors in amblyopic eyes

In our study, out of 148 amblyopic eyes of 103 patients, astigmatism was the most common refractive error (72.3 %) followed by hypermetropia (18.9%) and least was myopia (8.80%).

Hypermetropic Astigmatism was present in 57 amblyopic eyes (38.5 %). Our findings are consistent with studies done by Gupta et al.[27] in Dehradun as well as some other studies done by LiYP et al. in South China[34] and Robaei et al. in Australia[36].However, Menon et al.[23] had hypermetropia as the most common refractive error.

Strabismus Profile

In our study 24 patients (23.3%) were strabismic with esotropia in 15 patients (62.5%) and exotropia in 9 patients (37.5%). Thus,esotropia was more common than exotropia.Similar finding was present in studies done by Marthala et al.[26] in Karnataka and Shah et al. in Pakistan[35]. However, study Daigavane et al.[28] in Wardha had divergent squint more common than convergent squint.28.7% of amblyopic eyes with strabismus (combined /strabismic amblyopia) had visual acuity (<6/60). Majority of patients with amblyopia presented late with significant number presenting without any history of previous treatment. Anisometropic amblyopia was present in large proportion of patients as well as in those who presented in later ages.Thus, it demands an urgent need to take steps to increase awareness among parents and to perform screening in children to detect large uncorrected refractive errors which if not corrected timely can cause irreversible vision loss[36,37].

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