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RESEARCH ARTICLE

A CLINICAL STUDY ON PREVALENCE OF AMBLYOPIA AND R.E. IN SCHOOL CHILDREN OF KAMRUP(METRO) DISTRICT OF ASSAM, A N.E. STATE OF INDIA

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ABSTRACT

Aims And Objectives: The aim was to study the clinicodemographic profile of amblyopia and refractive error in 5-16 yrs in Kamrup (Metro) district of Assam, a North Eastern state of Assam.

Materials And Methods: This is a cross-sectional study, carried out in Government and private schools of Kamrup (Metro) region, during the academic session 2014-15.The study has been conducted from a tertiary care hospital in Guwahati, Assaam. A total of 12,104 students in the age group of 5 to 16 years were screened belonging to govt and private schools in Kamrup (Metro) region during the academic session 2014-2015 by a team, consisting of an ophthalmologist, an ophthalmology post graduate trainee and an ophthalmic assistant. Assessment of Va for distance was done with Snellen's visual acuity chart at class room illumination. Glass prescription was given to those with Vd <6/6 on the basis of cycloplegic refraction. Those with BCVA <6/6 were referred to RIO, GMCH for final diagnosis and further management. Treatment for amblyopia was done with macular (H.B.) stimulation and occlusion therapy in RIO, GMCH.

Results: Out of 12104 students screened, 845(7.0%) had refractive errors. Prevalence of amblyopia was found to be 98(0.81%). Higher prevalence of amblyopia is noted in boys and it is statistically significant. Myopia (65.9%) is found to be the most common refractive error in our study, however hypermetropia is the commonest refractive error in amblyopic children (58.2%) and it is statistically significant. The commonest type of amblyopia in our study is found to be anisometropic amblyopia (30.61%). The average age at which the child presents with amblyopia is 9.204±1.414 years with maximum children presented at the age group of 8 to 10 yrs (50%).Most of the amblyopic patients presented with visual acuity from 6/18 to 6/36 (43.87%).

Conclusion: As amblyopia is a preventable and treatable cause of paediatric low vision, early diagnosis and treatment of amblyopia can lead to a gross reduction in prevalence of amblyopia.
Thus, school eye screening can go a long way in early detection and spreading awareness to help reduce prevalence of uncorrected refractive error and amblyopia, , hence reducing childhood blindness.

INTRODUCTION

"Vision 2020, the right to sight", envisages to reduce avoidable blindness by 2020[1]. It is a global initiative with a major challenge to avoid the preventable blindness.

Refractive error is considered as an avoidable condition leading to visual disabilities in children. Hence the VISION 2020 initiative to eliminate avoidable blindness has given high priority to correction of refractive error and has placed it within the category of "childhood blindness."

Amblyopia is derived from the Greek word 'amblyos' meaning dull and 'opia' meaning vision. On the basis of origin, amblyopia can be named as: toxic amblyopia, nutritional amblyopia, hysterical amblyopia and functional amblyopia. Functional Amblyopia is defined as a decrease of visual acuity in one eye when caused by abnormal binocular interaction or

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occurring in one or both eyes as a result of pattern vision deprivation during visual immaturity, for which no cause can be detected during the physical examination of the eye and which in appropriate cases, is reversible by therapeutic measures.[49]

Amblyopia is one of the commonest causes of childhood visual impairment, the prevalence of which is usually underestimated, often because of lack of awareness. It has an estimated prevalence of 1 to 5%[7] and refractive error correction alone may successfully treat anisometric amblyopia in 25 to 75% of patients[6]. As amblyopia is a preventable and treatable cause of paediatric low vision, early diagnosis and treatment of amblyopia can lead to a gross reduction in prevalence of amblyopia. School children constitute 30 to 45% of total population in India. School going children therefore form an important large target group[5] and considering the fact that 30% of visually impaired person in India lose their sight before the age of 20 yrs[5] ,screening of these children plays an important role in early detection of amblyopia, and hence preventing the development of lifelong visual morbidity.

WHO has initiated a global initiative for the elimination of avoidable blindness by the year 2020 known as the VISION 2020. One of the five conditions of immediate priority is Childhood blindness.[1]

A healthy child of today can be the leader of tomorrow, if due rights are given properly in a package. Hence, to know the magnitude of the problem in our part of the region, a cross sectional study is done to evaluate the prevalence of amblyopia and the various management options in school children between 5 to 16 years in Kamrup (Metro) region.

The Kamrup (Metro) district was created on 3 February 2003 by bifurcation of the erstwhile Kamrup district. The district occupies an area of 1527.84 km²; with a total population of 1,260,419. There are 292 total numbers of schools in Kamrup (Metro) region (under Secondary Education Board of Assam, 2014). The total number of children in these schools accounted to more than 2 lakhs in the age group of 5-16 years. In 56 weeks of our study period, we planned to visit one school per week. However, as in the months of July and December, the schools used to be closed due to vacation; we planned to visit only 40 schools during our study period. In our study, 12104 school children of 40 schools were screened from the period September, 2014 to August, 2015.

Very little is reported in literature about prevalence of amblyopia in North East India among school going children. Therefore, it is of interest to assess these children for early diagnosis, prevention and management of amblyopia in our part of the country.

The aims and objectives of our study are stated below:

1. To determine the prevalence of amblyopia in school going children in the age group of 5-16 years in and around Kamrup Metro.
2. To determine the etiology and types of amblyopia.

MATERIALS AND METHODS

Place of study

This is a cross-sectional study, carried out in Government and private schools of Kamrup (Metro) region, during the academic session 2014-15.The study has been conducted from Regional Institute of Ophthalmology (RIO), Medical College and Hospital, Guwahati.

Period of study

The period of study extended from September, 2014 to August, 2015.

Selection of study sample

This is a cross-sectional study, carried out amongst students of class I-X standards, comprising of age group 5-16years, studying in Government and private schools of Kamrup (Metro) region, during the academic session 2014-15. The universe for this study consisted of 40 schools of Kamrup(Metro) district,comprising of 12,104 children. The sample size was calculated using standard formula 4 PQ/L2 where P = ocular morbidity prevalence, Q = 1-P and L = allowable error. Considering P = 0.03 [7] and L=10% of P, the sample size came to be more than 12,000 including 10% allowance for non response.

Selection criterion

The study sample was selected based on the inclusion and exclusion criterion.

Inclusion Criterion

1. School going children in the age group of 5-16 years irrespective of gender of Kamrup metro region.
2. Uniocular or binocular visual acuity less than 6/9 in either or both eyes.
3. Children with Strabismus, Anisometropia, Paediatric cataract etc. With visual acuity less than 6/9 in one or both eyes.
4. Patient with a history of previous treatment/currently taking amblyopia treatment.
5. Patient with prior intraocular or refractive surgery.

Exclusion Criterion

1. Age less than 5 years and more than 16 years.
2. Any organic ocular pathology.

Consent

The respective ethical clearance was obtained from ethical committee of Gauhati Medical College and Hospital, Guwahati .Written consents of school principals of all selected schools were obtained. Verbal consents of parents were obtained for screening their wards.

Field staff

The study field staff included two optometrists, an opthalmology post graduate trainee and one ophthalmologist.

Data collection tools

The data collection tools were as follows:

- Snellen's visual acuity chart
- Streak Retinoscope
- Direct ophthalmoscope
- Vision box with trial frame

METHODOLOGY

The age of children was recorded as per school register. History of present and past ocular problems and treatment, and family history were obtained. The clinical examination was done by the ophthalmologist. Anterior segment of the eye was examined with torch light. Retinal examination was performed with the help of direct ophthalmoscope after dilating the pupil. The refraction was done by the ophthalmic technicians. Assessment of visual acuity for distance was done with Snellen's chart and was recorded as the smallest line read with one or no errors at class room illumination, unaided (uncorrected visual acuity) as well as with spectacles (presenting visual acuity), if the child brought them.

In all children with visual acuity of less than 6/6, non cycloplegic refraction was performed with streak Retinoscope, followed by subjective correction till best corrected visual acuity was achieved. Those children with best corrected visual acuity less than 6/6 was referred to RIO, GMCH for final diagnosis and management.

In absence of any apparent organic lesion, bilateral amblyopia was diagnosed in eyes with best corrected visual acuity of less than 6/9 in both eyes and unilateral amblyopia was diagnosed when difference in best corrected visual acuity between two eyes was of two Snellen's lines or more. Those children were referred to RIO,Guwahati for detailed evaluation and further management.

The following detailed investigation was done in each case

1. Detailed history with respect to visual, ocular and general health, developmental and family history and use of medications. H/O poor vision in one or both eyes, and difficulty doing tasks requiring binocular depth perception or signs of strabismus, diplopia or other visual perceptual defects.
2. Routine ocular examination under diffuse and oblique illumination.
3. Opthalmoscopic examination to detect any abnormality in fundus.
4. Retinoscopic examination. The patient's refractive condition was evaluated under both non cycloplegic and cycloplegic conditions to determine whether (anisometropic or isoametropic) etiology. Cycloplegia was achieved by instilling atropine sulphate 1% eye ointment three times daily for three consecutive days . Post mydriatric subjective test was done after 2 weeks. Reassessment of visual acuity with best refractive correction is needed to avoid misdiagnosis of amblyopia.
5. Full orthoptic checkup including Hirschberg's corneal reflex test, cover test, Maddox wing test, etc were performed routinely to detect any heterophoria and to measure the deviation in case the patient is having squint. Range of accommodation and near point of convergence determined by R.A.F.binocular gauze.
6. State of binocular vision i.e. sensorimotor function was assessed by Worth's four dot test (presence of suppression and level of stereopsis) and by synaptophore (determine sensorimotor fusion at the angle of deviation).
7. Synaptophoric examination done with major amblyoscope, to measure both objective and subjective angle of deviation, assessment of status of binocular vision and abnormal retinal correspondence.

RESULTS AND OBSERVATIONS

Out of 12104 children screened between 5 to 16 years age group from 40 schools in Kamrup (Metro) region from the period between September, 2014 to August, 2015, 845 children (7.0%) had refractive error. Amblyopia was found in 98 children (0.81%).

Among the children screened, 5800 were boys and 6304 were girls. However, 507 girls (60%) and 338 boys (40%) had refractive error. Thus, refractive error was found to be more common among girls than boys. (p value <0.0001)

However, out of the 98 amblyopic children, 41 of them were girls and 57 were boys. Hence, amblyopia was found to be more common among boys and it was found to be statistically significant. (p value is 0.0319, 95% C.I. - 1.043 - 1.854)

In our study, myopia was found to be the most common refractive error (65.9%), followed by astigmatism in 21.8% and hypermetropia in 12.3%.

Table showing Refractive status of children with refractive error

	No of cases	Percentage
Hypermetropia	104	12.3%
Myopia	557	65.9%
Astigmatism	184	21.8%
Total	845	100%

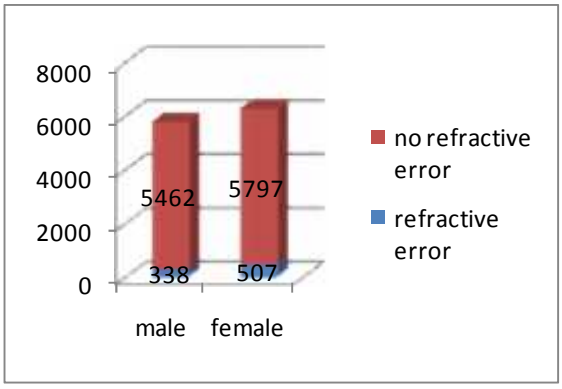


Chart 4 showing sex distribution of refractive error in school children 5-15 yrs of Kamrup (metro)

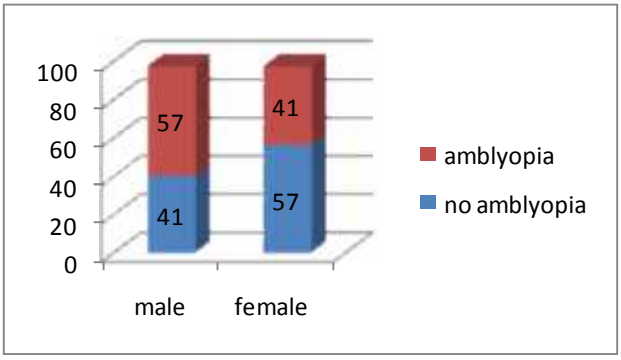
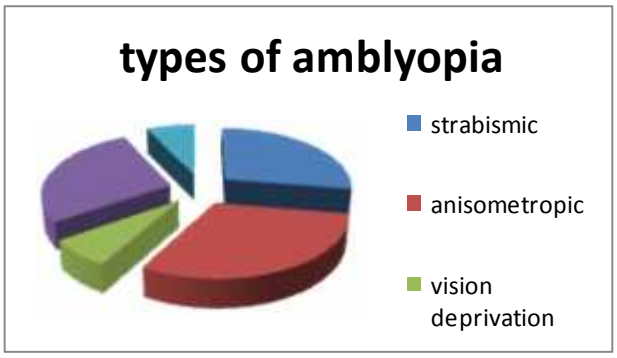


Chart 5 showing sex distribution of amblyopia in 5 to 16 year old children in Kamrup (Metro) region.



Anisometropic amblyopia was found to be the commonest type of amblyopia 30(30.61%), followed by strabismic amblyopia 27(27.55%) , mixed type 27(27.55%) , vision deprivation amblyopia 7 (7.14%) and meridional amblyopia 7 (7.14%).

The different types of amblyopia were found to be most common(49 children) in the age group of 8-10 yrs(50%).(p value <0.001). 25

children(25.5%) in the age group of 11-16 years had amblyopia and 24 children(24.5%) in the age group of 5-7 years were found to be amblyopic.

In the present study, the average age at presentation with amblyopia is 9.204±1.414 years. Maximum children presented at the age group of 8 to 10 yrs (50%).

Table 2 showing age distribution of amblyopia

Age	Male	Female	Total
5-7 yrs	19	5	24
8-10 yrs	26	23	49
11-15 yrs	12	13	25
	57	41	98

Chart 7 showing age and sex distribution of amblyopia.

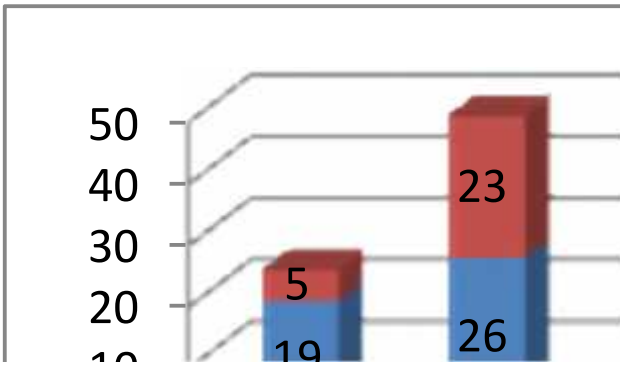


Table 3 showing age distribution of different types of amblyopia.

	5-7 yrs	8-10 yrs	11-15 yrs	Total
Strabismic	10	9	8	27
Anisometropic	7	10	13	30
Combined	4	20	3	27
Sensory deprivation	2	5	-	7
Meridional	1	5	1	7
Total	24	49	25	98

Chart 8 showing age distribution of different types of mblyopia.

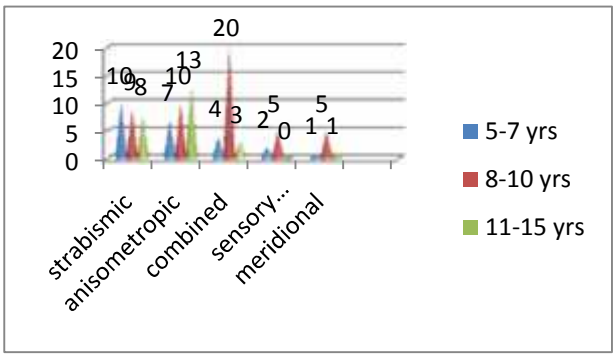
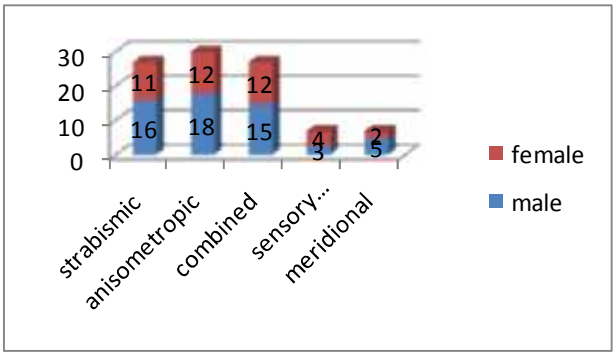


Table 4 showing sex distribution of different types of amblyopia

	Male	Female
Strabismic	16	11
Anisometropic	18	12
Combined	15	12
Sensory deprivation	3	4
Meridional	5	2
Total	57	41

Chart 9 showing sex distribution of different types of amblyopia.



Among the 27 strabismic amblyopic patients, 18 patients (66.67%) had esotropia and rest 9(33.33%) of them had exotropia. 3 patients had associated nystagmus.

Table 5 showing distribution of cases in strabismic amblyopia

Type of strabismus	No of cases	Percentage
Esotropia	18	66.67%
Exotropia	9	33.33%

In our study, 42 children among the 98 amblyopic children had a positive family history of refractive error (42.8%). Rest 56 amblyopic children (57.2%) had no positive family history. Hence, family history of refractive error has no correlation with amblyopia. (p value is 0.4178)

Table 6 showing correlation of family history in amblyopia

	Positive family history	Negative family history
Amblyopia	42(42.8%)	56(57.2%)

Table 7 Visual acuity and amblyopia

	>6/18	6/18-6/36	6/60-3/60	<3/60
Strabismic	5	15	5	2
Anisometropic	10	14	5	1
Combined	6	11	7	2
Sensory deprivation	-	-	2	5
Meridional	2	3	2	-
Total	23	43	21	10

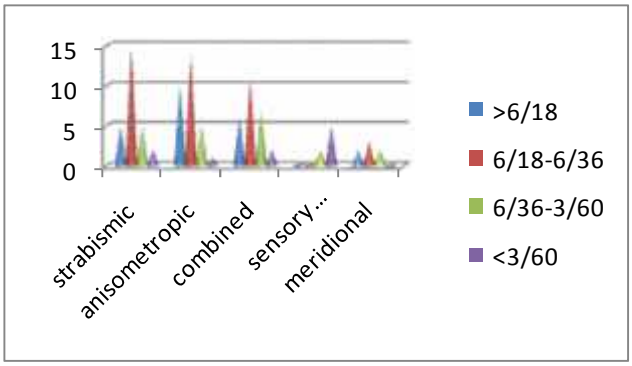


Chart 10 showing correlation between visual acuity and amblyopia.

In this study, 43(43.8%) amblyopic children were found to have visual acuity between 6/18-6/36. 23 (23.46%) children had visual acuity better than 6/18 , 21(21.4%) had 6/60-3/60, and only 10 children (10.2%) had visual acuity poorer than 3/60.

Table 8 showing Refractive status of amblyopic eye

	Hypermetropia	Myopia	Astigmatism	Total
Strabismic	16(59.3%)	8(29.6%)	3(11.1%)	27(100%)
Anisometropic	18(60%)	10(33.33%)	2(6.67%)	30(100%)
Combined	15(55.5%)	8(29.6%)	4(14.8%)	27(100%)
Meridional	-	-	7(100%)	7(100%)
Sensory deprivation	4(57.1%)	2(28.5%)	1(14.3%)	7(100%)
Total	57(58.2%)	28(28.5%)	17(17.3%)	98(100%)

Hypermetropia was found to be the most common refractive error in amblyopic eye (p value <0.05). Out of 98 amblyopic children, 57 (58.2%) had hypermetropia, followed by myopia in 28 children (28.5%) and astigmatism in 17 children (17.3%). Among the 30 anisometropic children, 18 children (60%) had hypermetropia, 10 of them (33.33%) had myopia and rest 2 children (6.67%) had astigmatism.

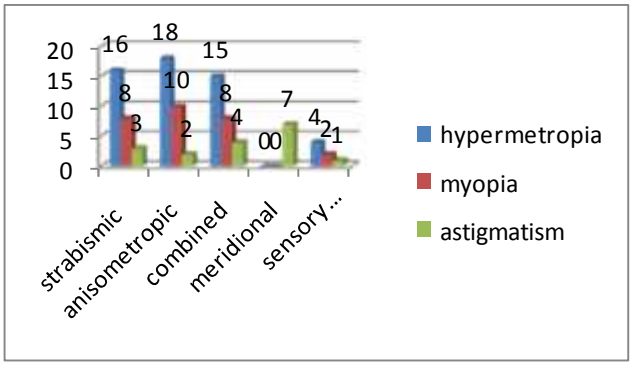


Chart 11 showing refractive status of amblyopic eye.

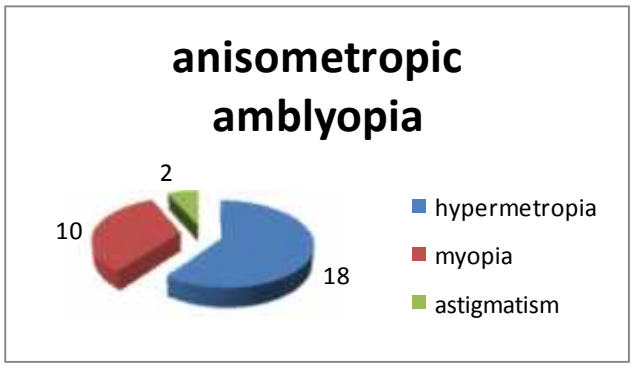


Chart 12 showing refractive status of anisometropic amblyopia

DISCUSSION

The results and observations are compared with observations made by other authors in similar studies and are elaborately discussed.

Table 1 showing comparison of prevalence of refractive error (ref. Chart 1)

Authors	Prevalence of refractive error
Padhye AS et al(2004-05), Pune	5.46%
Singh et al (2006-2009),Bhopal	13.08%
Ghosh S et al(2008-09), RIO, Kolkata	14.7%
Gupta et al (2010), Shimla	4.06%
Mondal A et al (2013-2014), Kolkata	9.40%
Present study	7.0%

The prevalence of refractive error in our study was 7% which was comparable to the studies by Padhye AS *et al*, Singh *et al*, Gupta *et al* and Mondal *et al*.

Table 2 showing comparative studies on prevalence of amblyopia(ref. Chart 2)

Authors	Prevalence of amblyopia in school and pre school children
McNeil et al, 1955	2.7%
da Cunha and Jenkins, 1961.	1.7%
Russell and associates, 1961.	1.3%
Vaughan and associates, 1960.	0.6%
Padhye AS et al(2004-05), Pune	0.8%
Singh et al (2006-2009),Bhopal	0.49%
Gupta et al (2010), Shimla	0.05%
Mondal A et al (2013-2014), Kolkata	1.09%
Present study	0.81%

The Prevalence of amblyopia was found to be 0.81%., which is comparable to the various studies done internationally as well as in India.

Table 3 showing comparative analysis among mean age at presentation of amblyopia

Authors	Mean age
Sharma P *et al*, Uttarakhand	8.56 +/- 3.80 years
Soumya PD *et al*, Mangalore (2011)	10.61 +/- 3.89 yrs
Present study	9.204 +/- 1.414 yrs

The mean age at presentation of amblyopia in our study was found to be 9.204 +/- 1.414 years with maximum amblyopia in the age group of 8 to 10 years, which is comparable to the other similar studies.

Refractive error was found to be more common among girls and myopia was found to be the most common refractive error followed by astigmatism and hypermetropia.

Table 4 showing sex distribution of refractive error and amblyopia (ref. Charts 4 and 5)

Authors	% of males with R.E	% of males with amblyopia	% of females with R.E.	% of females with amblyopia
Ghosh S et al	48%	39%	52%	61%
Sharma et al, Soumya PD et al, 2011		61.11% 56.81%		38.89% 43.19%
Siddharam SJ et al, 2014		63.79%		36.21%
Present study	40%	58.17%	60%	41.83%

In our study, amblyopia was found to be more common in boys. The most common type of amblyopia in our study is found to be anisometropic amblyopia (30.61%) This is followed by strabismic amblyopia (27.55%), Mixed type (strabismic + anisometropic) 27.55%, vision deprivation amblyopia (7.14 %) and meridional amblyopia (7.14 %), which is found to be comparable to the various other similar studies.

Table 5 showing comparative study on different types of amblyopia(ref. Chart 6)

Authors	Strabismic amblyopia	Anisometropic amblyopia	Vision deprivation amblyopia
Sharma P et al,	27.7%	33.33%	11.11%
Soumya PD et al	25%	29.5%	4.5%
Siddharam SJ et al	25.86%	36.20%	
Present study	27.55%	30.61%	7.14%

About 66.67 % of strabismic amblyopic patient had esotropia and rest 33.33 % had exotropia in our study, which is comparable to the study by Sharma P *et al*. However, more exotropia was found in studies by Siddharam S J *et al*, Soumya PD *et al*.

In our study, family history of refractive error was found to have no correlation with amblyopia. 42.8 % of amblyopic patients had positive family history and 57.2 % had no family history of refractive error.

Most of the patients with amblyopia were found to have visual acuity from 6/18 to 6/36 (43.8%). Only 10.2 % amblyopic children had visual acuity poorer than 3/60, which is comparable to the study by Sharma P *et al*.

Table 6 showing comparative study on amblyopia and visual acuity(ref. Chart 10)

Authors	6/18-6/36	6/60- 3/60	<3/60
Sharma P et al	44.06%	25.42%	25.42%
Present study	43.87%	21.43%	10.2%

Hypermetropia was found to be the most common refractive error in amblyopic children in our study (58.2%) followed by myopia and astigmatism, which is comparable to the various similar studies by different authors discussed below. 60% of anisometropic amblyopic children had hypermetropia, thus hypermetropia was the common refractive error in anisometropic amblyopia.

Table 7 showing comparative study on refractive status of the amblyopic eye (ref. Chart 11)

Authors	Hypermetropia	Myopia	Astigmatism
Sharma P et al	82.46%	17.54%	
Soumya PD et al	45.45%	47.72%	
Siddharam SJ et al	46.15%	25.64%	18.2%
Present study	58.2%	28.5%	17.3%

Limitation of The Study

Though there are 292 schools in Kamrup (Metro) region with approximately 2 lakhs school children in the age group of 5 to 16 years but due to certain limitations in our study we could only screen 12104 children . Few of them are cited below.

1. The average time required to screen a child takes a minimum of 10 minutes. During a period of 4 to 5 hours, it is very difficult to accommodate all the children.
2. The school screening team consisted of one ophthalmologist, one ophthalmology post graduate trainee and an optical technician. Thus lack of adequate trained man power is another limitation of our study.
3. Taking permission and arranging school screening camps in the respective schools is another limitation of our study. Many a times, the screening camp had to be cancelled due to ongoing examinations or festivals.

SUMMARY AND CONCLUSION

The present study was carried out in school children in the age group of 5 to 16 years belonging to Kamrup (Metro) region for a period of one year from September, 2014 to August, 2015.

1. A total of 12,104 school children were screened from 40 government and private schools in a period of one year with the help of a field staff including two optometrists, an ophthalmology post graduate trainee and a senior ophthalmologist.
2. Out of 12,104 children, 845 had refractive error and 98 had amblyopia. Thus, prevalence of refractive error was found to be 7.0% and that of amblyopia was 0.81%.
3. The age of children was recorded as per school register. The children were divided into 3 groups on the basis of age: 5-7 yrs, 8-10 yrs and 11-16 yrs. Maximum number of amblyopic children were in the age group of 8-10 yrs(50%) with mean age at presentation being 9.204 +/- 1.414 years.
4. Refractive error was found to be most common among girls(60%) and myopia was found to be the most common refractive error(65.9%) followed by astigmatism in 21.8% and hypermetropia in 12.3%.
5. Amblyopia was found to be more common among boys(58.16%) and Hypermetropia was found to be the most common refractive error in amblyopic eye(58.2%), followed by myopia in (28.5%) and astigmatism in (17.3%).
6. On the basis of visual acuity of the amblyopic children, they are divided into 4 groups. Most of the amblyopic children(43.8%) were found to have visual acuity between 6/18-6/36. 23.46% children had visual acuity

better than 6/18 , 21(21.4%) had 6/60-3/60 , and only 10 children(10.2%) had visual acuity poorer than 3/60.

7. Family history of refractive error was found to have no correlation with amblyopia. 42.8 % of amblyopic patients had positive family history and 57.2 % had no family history of refractive error.
8. Anisometropic amblyopia (30.61%)was found to be the most common type of amblyopia. This was followed by strabismic amblyopia (27.55%), Mixed type (strabismic + anisometropic) 27.55%, vision deprivation amblyopia (7.14 %) and meridional amblyopia (7.14 %). 60% of anisometropic amblyopic children had hypermetropia, thus hypermetropia was the common refractive error in anisometropic amblyopia.
9. About 66.67 % of strabismic amblyopic patient had esotropia and rest 33.33 % had exotropia in this study.

CONCLUSION

This screening study would serve a useful purpose in detecting one of the common causes of vision impairment in early life and thus help in drastically reducing it. It would also help in providing a better life to the children and thus help in attaining the global initiative for elimination of avoidable blindness by 2020.

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