Refractive status among the students presenting to Geta Eye Hospital, Kailali, Nepal

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ABSTRACT

A retrospective hospital based study was designed in order to evaluate the refractive status of students presenting to Geta Eye Hospital. All the hospital record of secondary level school students were collected from the record unit of the hospital. Children below 5 years of age and those with incomplete record were excluded from the study. All students who visited Geta Eye hospital during May 1 to July 30, 2007 AD were included in the study. Out of 328 students presenting to Geta Eye Hospital, presenting visual acuity was normal (6/6) in 67.4% students, while 32.6% had reduced presenting visual acuity. Altogether 7.0% students had presenting visual acuity worse than 6/18 in the better eye and 2.4% improved to better than 6/18 with correction. Significant refractive error (>0.50 D Spherical Equivalent) was found in total of 32.0% students. Myopia was present in 11.89% students, whereas Astigmatism and hypermetropia were present in 11.3% and 8.8% of the total students respectively. Out of total students, 95.4% students were found to have best corrected visual acuity of 6/6- 6/18 in the better eye. There were 4.0% students in MVI category and 0.6% in SVI category after correction. Altogether 7.6% cases of amblyopia were found. Hyperopia was most commonly associated with amblyopia. Associated ocular morbidity in either eye was assessed and was found in 25.0% students. 6.4% cases had convergence insufficiency. About one third of the students presenting to hospital had significant refractive error. Thus, School can be our peripheral referral unit if we could train teachers to detect abnormal vision.

Keywords: Refractive error, amblyopia, Nepal.

INTRODUCTION

The normal condition of the eye, in which, with no accommodation, parallel light is focused on the retina, is called emmetropia. Ametropia or refractive error is the general term for any refractive condition other than emmetropia, or condition in which eye with accommodation relaxed, parallel rays of light fail to converge to a sharp focus on the retina. Categories of are refractive error are myopia, hyperopia, and astigmatism. Myopia is the condition in which, with accommodation relaxed, parallel rays of light converge to a focus in front of the retina. Hyperopia is the condition in which, with accommodation relaxed, parallel rays of light converge to a focus behind the retina. Astigmatism is a refractive condition in which the eye's optical system is incapable of forming a point image for a point object.[1]

A refractive error is determined by two factors: first, refractive power of the cornea and the lens and the second, axial length of the eye. These elements are usually correlated so that long eyes have less refractive power and short eyes have more refractive power, which minimizes any refractive error.[2] Mismatches between these factors results refractive error and this occurs usually during childhood, when the eyes are growing.

The exact causes of refractive errors are still being studied, but it is known that both hereditary and environmental influences can affect their development.[3]

It is estimated that globally 153 million people over 5 years of age are visually impaired as a result of uncorrected refractive errors, of which 8 million are blind. Some 12.8 million in the age group 5–15 years are visually impaired from uncorrected or inadequately corrected refractive errors, a global prevalence of 0.96%, with the highest prevalence reported in urban and highly developed urban areas in south-east Asia and in China.[4]

Undetected or under corrected refractive error, particularly myopia, is especially a problem in school children. Poor vision and the inability to read material written on the blackboard can have a serious impact on a child's participation and learning in class and this can adversely affect a child's education, occupation and socio-economic status for life.[5]

A series of population-based surveys of refractive error and associated visual impairment in school-age children, sponsored by the WHO, were conducted in five different geographic regions using a common protocol- the refractive error survey in children (RESC).[6] These

comparative studies elucidated some important differences in the prevalence of vision problems across different geographic regions. The prevalence of uncorrected, baseline (presenting), and best visual acuity 0.5 (20/40) or worse in at least one eye in different countries were 12.8% (China),[7] 2.7% (rural population of India),[8] 6.4% (urban population of India),[9] 2.9% (Nepal),[10] 10.9% (China),[7] 2.6% (rural population of India),[8] 4.9% (urban population of India),[9] 2.8% (Nepal)[10] and 1.8% (China),[7] 0.8% (rural population of India),[8] 0.8% (urban population of India),[9] 1.4% (Nepal),[10] respectively. Refractive error was the cause in 89.5% (China)[7], 61% (rural population of India),[8] 81.7% (urban population of India),[9] 56.0% (Nepal),[10] amblyopia in 5.0% (China),[7] 12.0% (rural population of India),[8] 4.4% (urban population of India),[9] 9.0% (Nepal),[10] other causes in 1.5% (China),[7] 15% (rural population of India),[8] 8.0% (urban population of India),[9] 19.0% (Nepal),[10] with unexplained causes in the remaining 4.0% (China), 13.0% (rural population of India),[8] 5.9% (urban population of India),[9] 16.0% (Nepal).[10] The prevalence of myopia did not differ markedly between 5 years old in these countries (China < 1.0%; Nepal < 2.0%; Chile 3.5%); however, the prevalence of myopia was much higher in Chinese 15 years olds (males 36.7%; females 55.0%) compared to 15 years old in Nepal (males 2.0%; females 1.0%) and Chile (males 25.0%; females 15.0%). Conversely, the incidence of moderate or high hyperopia (< 2 D) in children 5-15 years of age was much higher in Chile (Nepal 1.1%; China 8.5%; Chile 21.6 %). The higher percentage of moderate and high hyperopes in Chile would suggest that White populations are more likely to be hyperopic than Asian populations.[11]

The problem is so prevalent that it does not only interfere with the children's ability to attend classes and study, but also creates grave social consequences. Teachers who do not realize the plight of the children, for example, accuse them of laziness or stupidity and humiliate them persistently. Unsympathetic classmates also pester them and laugh at them in the classrooms and as well as in playgrounds. Even their parents and siblings undermine and discourage these unfortunate children.[12]

All these data reflect that reduced vision due to refractive error is common in school students. Students' visual demand is increasing in today's modern education system. They have to do more and more vision demanding tasks, that too at an early age. Stimulus deprivation conditions like refractive error, ptosis, squint, corneal scar and even conjunctivitis not treated in time might lead to amblyopia. If amblyopia could not be detected early it might cause irreversible vision loss. This can be prevented simply by optical correction. Often all that is required is an eye examination and a pair of glasses. Thus, efforts are needed to direct programs that make spectacles affordable for school children. This in turn will help prevent the development of childhood amblyopia and enable better performance at school. Thus, a study was designed to gather information on refractive status of students presenting to hospital so that better approach can be planned to tackle this huge burden of readily correctable problem.

In addition to that, the finding that can be obtained will assist in enhancing social awareness and minimizing the misery of the children. Also, the corrective measure can help to encourage the children not to quit school. It is with these fundamental aims that this study was designed. Accordingly, the specific objectives of this study were; a) to determine the prevalence of vision problem due to refractive errors, b) to find out the distribution of the possible refractive states in the study areas, and c) to investigate the degree of association between selected variables (sex, age, educational status and geographical area) and the presence of refractive errors

METHODOLOGY

A retrospective hospital based study was designed in order to evaluate the visual status of the students presenting to hospital. Hospital record of secondary level school students were collected from the record unit of Geta Eye hospital. Children below 5 years of age and those with incomplete record were excluded from the study. All students visiting Geta Eye hospital during May 1 to July 30, 2007 AD were included in the study.

Presenting visual acuity of all children was taken with the help of internally illuminated snellen's vision chart. Pinhole vision was also taken in eyes with visual acuity worse than 6/6. Pupillary reaction was assessed in all cases with the help of focusable torch light. Refraction was done in all cases with the help of autorefractometer. Subjective refraction was done with the help of trial set. Cycloplegic refraction was carried out where required
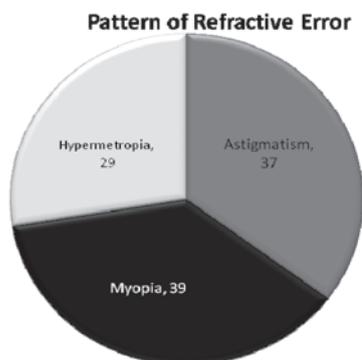

Pattern of Refractive Error

Hypermetropia, 29

Astigmatism, 37

Myopia, 39

Fig. 1. Proportion of significant refractive error

Table-1: Age and Gender wise pattern of refractive error

Refractive Error	<10 years 'n'	%	≥ 10years 'n'	%	Total			
					Male 'n'	%	Female 'n'	%
Hyperopia	2	0.6	27	8.2	12	3.4	17	5.2
Myopia	3	0.9	36	11.0	16	4.9	23	7.0
Astigmatism	3	0.9	34	10.4	19	5.8	18	5.5
Total	8	2.4	97	29.6	47	14.3	58	17.7

followed by subjective refraction after 3 days. All children were evaluated under slitlamp to see any abnormality in the anterior segment and funduscopy was performed in all the cases with the help of direct and indirect Ophthalmoscope as well as fundus biomicroscopy was performed where required. Extra ocular movements were assessed in all cardinal gazes. Hirschberg test was assessed in cases suspected of ocular misalignment followed by cover test where required. Convergence test was performed in all cases with the help of RAF rule.

Presenting vision is defined by the visual acuity in the better eye using currently available refractive correction, if any. Best-corrected vision is the visual acuity in the better eye achieved by subjects tested with pinhole or refraction.[13]

The diagnostic criteria used for refractive error was 0.50 Dioptres Spherical equivalent or more. Data processing was done using Microsoft office access program. An Optometrist examined all cases in Geta eye hospital referring some cases requiring consultation, to an Ophthalmologist.

RESULTS

Out of 439 students who visited Geta eye hospital, complete record of only 328 (74.7%) students was obtained. Among them, female were 187 (57.0%) and male were 141 (43.0%). Presenting visual acuity was normal (6/6) in 221 (67.4%) students, while 107 (32.6%) had presenting visual acuity less than 6/6. Altogether 23 (7.0%) students had presenting visual acuity worse than 6/18 in the better eye. Out of these 23 students, 8 (2.4%) improved to equal to or better than 6/

18 with correction. Significant refractive error (>0.50 diopters spherical equivalent) was found in total of 105 (32.0%) students. Myopia was present in 39 (12.0%) students. Astigmatism and hypermetropia were present in 37 (11.3%) and 29 (8.8%) students respectively (Fig 1).

WHO criteria were used to define visual impairment. Altogether 313 (95.4%) students were found to have best corrected visual acuity of 6/6- 6/18 in the better eye while 15 (4.6%) remained in visual impairment category. There were 13 (4.0%) students in MVI (moderate visual impairment) category and 2 (0.61%) in SVI (severe visual impairment) category. None of the students were found to be in the blind category (Fig 2).

There were altogether 29 students in the age group less than 10 years and 299 students in the age group e" 10 years. In the age group <10 years, 8 (2.4%) students were found to have significant refractive error whereas in the age group e" 10 years 97 (30.0%) students were found. Similarly female students were 58 (17.7 %) and male students were 47 (14.3%) (Table-1).

Of the 23 students with presenting visual acuity worse than 6/18 in the better eye, 10 (2.4%) had refractive error, 9 (2.74%) had amblyopia and 4 (1.2%) had posterior segment diseases (Fig 3).

	6/6 to 6/18	MVI	SVI
■ BCVA	95.43%	3.96%	0.61%
▨ PVA	92.99%	4.27%	2.74%
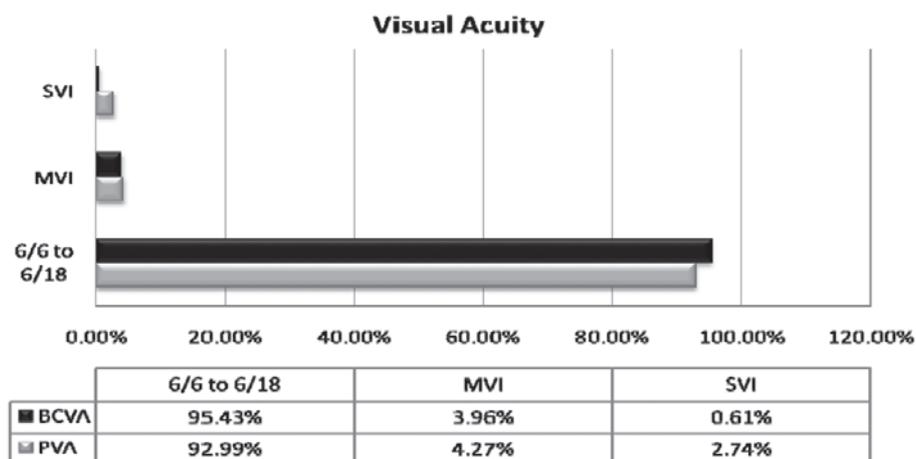
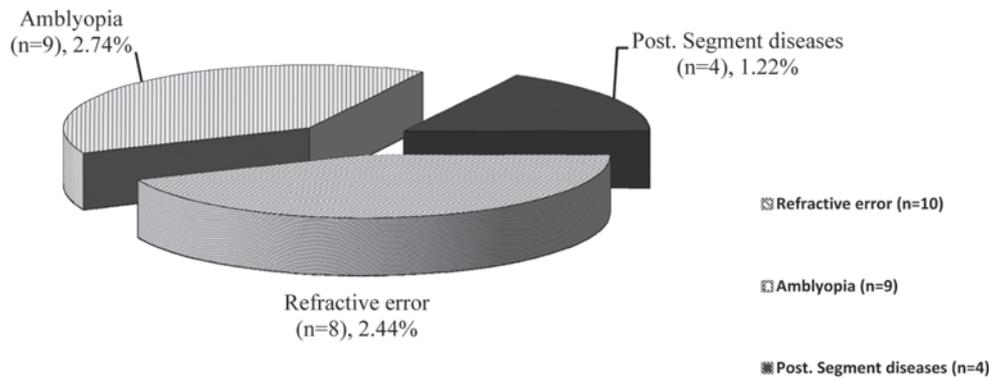**Fig. 2.** Best corrected visual acuity in better eye.

Fig. 3. Causes of visual impairment in better eye on presentation

Altogether 25 (7.62%) cases of amblyopia were found. Amblyopia due to hyperopia was present in 11(3.3%), astigmatism in 10 (3.0%) and myopia in 4 (1.2%). Hyperopia was most commonly associated with amblyopia. Associated ocular morbidity in either eye was assessed and was found in 82 (25.0%) students. Maximum number of cases 21 (6.40%) were of convergence insufficiency and intermittent exotropia (IXT) was found in 12 (3.7%) cases. Ptosis, retinal diseases, toxoplasmosis, bleharophimosis syndrome and high myopia, nystagmus, chalazion, corneal opacity, glaucoma suspect, latent squint and others were the types of morbidity found. One case of congenital cataract was also found.

DISCUSSION

Out of the total students presenting to hospital, 328 (74.7%) were included in the study. Presenting visual acuity was normal (6/6) in 221 (67.4%) students, while 107 (32.6%) had presenting visual acuity less than 6/6. This shows about 1/3rd of the students present to hospital with reduced vision. Altogether 23 (7.0%) students had presenting visual acuity worse than 6/18 in the better eye. Out of these 8 (2.4%) improved to better than 6/18 with correction. Similar results were obtained from a study done in John Hopkins school of Medicine, Baltimore, USA where the prevalence of presenting visual acuity worse than 20/40 was 8.2%.[14] In a study done by RESC group in Children in a Rural Population in India found the baseline (presenting), and best corrected visual acuity of 20/40 or worse in the better eye was 2.6%, and 0.78%, respectively.[15] In a study done by same group in Mechi zone of Nepal showed best visual acuity 0.5 (20/40) or worse in at least one eye was 2.8%, and 1.4%, respectively.[10] The results of our study were in contrast with the study carried out by RESC group, probably because of different cut off points on visual acuity taken, i.e. we have taken visual acuity less than 6/18 while they had taken visual acuity less than 6/12 and the another reason might be that those students only with ocular problem visited to the hospital.

In a study done by Kalikivayi V et al. in India, the presenting visual acuity was found to have < 6/18 in the better eye in 3.1% cases among 3,669 children.[16]

Significant refractive error (>0.50 diopter spherical equivalent) was found in total of 105 (32.0%) students. In a study done in Kathmandu, Nepal, they found refractive error was the commonest problem seen accounting for 21.9% out of total.[17] In a study done in eastern part of Nepal, refractive error was the cause in 56.0% of the 200 eyes with reduced uncorrected vision.[10] Refractive error was the cause in 89.5% of the 1,236 eyes with reduced vision, in a study done in China.[7] In our study, myopia was the most common refractive error found. Similar results were obtained in a study done in Kathmandu where it was found myopia as the commonest type of refractive error (4.3%) as opposed to hypermetropia (1.3%).[16] This might be due to people being more conscious about their reduced vision. In a study done in India, prevalence of hyperopia was 22.6% and myopia 8.6%.[18] These differences in refractive error data were probably because of different diagnostic criteria used for refractive error.

Visual impairment was defined according to WHO criteria. Altogether 313 (95.4%) students were found to have best corrected visual acuity of 6/6- 6/18 in the better eye while 15 (4.6%) remained in visual impairment category after best correction. None of the students were found to be in the blind category. In a study done by RESC group, it was found that with best corrected visual acuity, visual impairment was substantially reduced, ranging from 0.09% in China to 0.3% in rural India.[19] Visual impairment of 4.6% even after correction in our study gives an indication that more extensive studies are required to confirm it. This also indicates that preventive measures are required to avoid irreversible cause of vision loss. In the age group <10 years, 8 (2.4%) students were found to have significant refractive error whereas in the age group e" 10 years 97 (30.0%) students were found. This may be due to the reason that there was a small sample size in children < 10 years age group

in this study. Similarly female students were 58 (17.7%) and male students were 47 (14.3%). Female were found to be predominantly affected by refractive error.

Of the 23 students with presenting visual acuity worse than 6/18 in the better eye, 7 (2.1%) had amblyopia. Altogether 25 (7.6%) cases of amblyopia were found. Similar results were obtained from the study done in mechi where 9% had amblyopia.[10] In a study done by RESC group in china amblyopia was found in 5%.[7] In our study hyperopia was the commonest type of refractive error causing amblyopia.

Associated ocular morbidity in either eye was assessed and was found in 82 (24.9%) students. In majority of the students 21 (6.4%) convergence insufficiencies was found and intermittent exotropia (IXT) was found in 12 (3.7%) cases. Ptosis, retinal diseases, toxoplasmosis, bleharophimosis syndrome and high myopia, nystagmus, chalazion, corneal opacity, glaucoma suspect, latent squint and others were the types of morbidity found. One case of congenital cataract was also found.

In conclusion, refractive error is the commonest type of ocular morbidity accounting 32.0% among them myopia was the commonest type. Altogether 7.6% cases of amblyopia were found and common cause in refractive error. As one third of the students presenting to hospital had significant refractive error, School can be our peripheral referral unit if we could train teachers to detect abnormal vision. Accordingly, based on the findings of the present study the following recommendations are forwarded: a) vision testing programmes in schools should be developed and children should be screened at least once during early adolescence, and b) ways of providing lenses either free of charge or at a reduced cost should be considered for those children with refractive errors of <6/12 and who cannot afford to buy the glasses.

LIMITATIONS

This is a retrospective study done on small number of students, so full picture on the prevalence couldn't be obtained. Same standards might not have been possible to maintain in all cases as this is a retrospective study compromising the validity of the data. There might have been inter-observer variation during data collection as this was not kept in mind during the time of examination. The age groups do not have comparable number of students. The number of students in age group less than 10 years is very low.

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