WORLD VIEW

Ocular morbidity in schoolchildren in Kathmandu

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Background/aims: Any information on eye diseases in schoolchildren in Nepal is rare and sketchy. A programme to provide basic eye screening to schoolchildren with an aim to provide services as well as gather information on ocular morbidity has been started.
Methods: All the children in the schools visited are included in the study. This programme is targeted at poor government schools, which are unable to afford this service. A complete eye examination is given to all the children including slit lamp examination, fundus evaluation and retinoscopy, and subjective refraction.
Results: A total of 1100 children from three schools are included in this report. 11% of our schoolchildren have ocular morbidity, 97% (117 out of 121) of which is preventable or treatable. Refractive error is the commonest type of ocular morbidity (8.1%). Myopia is the commonest type of refractive error (4.3%) as opposed to hypermetropia (1.3%). 12.4% of children with refractive error have already developed amblyopia. Strabismus is the second commonest type of ocular disability (1.6%). Alternate divergent squint is the commonest type of strabismus (1.4%). Traumatic eye injuries (0.54%), xerophthalmia (0.36%), and congenital abnormalities (0.36%) are much less common.
Conclusion: A school eye screening cum intervention programme with periodic evaluation seems to be appropriate for countries like Nepal as most of the eye diseases found are preventable or treatable.

There are about 5.5 million children in Nepal below 16 years of age. About 3.7 million of these are of school age (5–16 years).[1] The Nepal Blindness Survey conducted in 1981 found relatively few cases of childhood blindness. The main causes of blindness in children in that survey were ocular infections, xerophthalmia, and congenital cataract.[2] The Nepal Xerophthalmia Survey, also conducted in 1981, showed that 1.65% of children below 14 years of age had Bitot's spot presumed to be due to vitamin A deficiency.[3] A refractive error study from the Mechi Zone of Nepal conducted in 1997 showed 2.9% children had visual morbidity of which 56% was due to refractive error.[4] However, no large scale study has been done in recent years to evaluate the ocular morbidity in schoolchildren in Nepal.

Because of this the BP Koirala Lions Center For Ophthalmic Studies (BPKLCOS) started the "Clear vision initiative: a school program for healthy eyes" from April 2002. The mission of the programme is to provide basic eye screening to and promote eye health care among Nepal's school population, targeted at poor schools unable to afford this service. This programme also provides training in basic eye screening and eye health to teachers at schools visited. Children are also provided with glasses and medicines when necessary. When confronted with diseases that cannot be managed at schools they are brought to BPKLCOS for appropriate management. An evaluation report of this screening cum intervention programme is ongoing.

METHODS AND MATERIALS

All the children attending the schools visited were included in the study. Very few children who were unwilling to participate or were absent at the time of the school visit were left out. We have screened only three schools at present. They are Ganesh High School at Tathali, Bhaktapur, Devi High School at Tathali, Bhaktapur, and Tilingatar High School at Dhapashi, Kathmandu. Any government school in Kathmandu, Lalitpur, or Bhaktapur districts willing to participate in the programme will be included in the study. The schools are informed in good time and appropriate arrangements are made for the screening at a given date and time. Cooperation is sought and received from the teachers at schools. They are trained on the spot in vision screening and detection of common ocular problems. A short talk supported by charts, posters, audio and audiovisual tapes, etc, regarding eye health education is given to children at each visit.

The team carrying out the school screening consists of an ophthalmologist, an ophthalmic resident, a senior ophthalmic technician, an optometrist, an optometry student, and a driver.

The materials taken with the team are internally illuminated vision drum (Appasamy, India), E charts, torch lights, ruler, hand held slit lamp (Clement Clarke, UK), another hand held slit lamp (Heine, Germany), direct ophthalmoscope, retinoscope, trial set, universal trail frame (Nikon), RAF rule, charts, posters, audio tapes, audiovisual tapes, proforma, etc.

The students undergo the following examination:

- Visual acuity—unaided, pinhole, and with glasses from a distance of 6 metres
- Extraocular movements, cover tests, and convergence test using RAF rule
- Examination with a torch light
- Slit lamp biomicroscopy with hand held slit lamp
- Retinoscopy and subjective refraction
- A cycloplegic refraction when needed, followed by subjective refraction after 3 days
- Fundus evaluation with a direct ophthalmoscope
- Fundus evaluation with dilated pupil when the vision is not fully corrected and in cases of traumatic eye injuries.

The diagnostic criteria used in the study are as follows. A diagnosis of myopia is made if refractive error is more than –0.5 dioptre. Similarly, hypermetropia is recorded if it is more than +1.0 dioptre after cycloplegic refraction. The drug used for cycloplegic refraction is tropicamide 1% used twice, one drop in each eye, at an interval of 10 minutes. Astigmatism is recorded if it is more than 0.50 dioptre. A diagnosis of

Table 1 Prevalence of ocular morbidity

Type of ocular morbidity	No (%)		
	Male	Female	Total
Refractive error	41 (3.73)	48 (4.36)	89 (8.09)
Simple myopia	22 (2.0)	25 (2.27)	47 (4.27)
Myopic astigmatism	10 (0.91)	18 (1.63)	28 (2.54)
Hypermetropia	9 (0.82)	5 (0.45)	14 (1.27)
Strabismus	8 (0.73)	10 (0.91)	18 (1.63)
Alternate divergent squint	7 (0.63)	8 (0.73)	15 (1.36)
Alternate convergent squint	0 (0.0)	1 (0.09)	1 (0.09)
Right divergent squint	1 (0.09)	1 (0.09)	2 (0.18)
Traumatic eye injury	4 (0.36)	2 (0.18)	6 (0.54)
Injury with a stick	3 (0.27)	0 (0.00)	3 (0.27)
Fall on the ground	1 (0.09)	1 (0.09)	2 (0.18)
Flame burn	0 (0.0)	1 (0.09)	1 (0.09)
Vitamin A deficiency	2 (0.18)	2 (0.18)	4 (0.36)
Congenital abnormalities	1 (0.09)	3 (0.27)	4 (0.36)
Coloboma of iris and disc	0 (0.0)	2 (0.18)	2 (0.18)
Epiblepharon	1 (0.09)	0 (0.0)	1 (0.09)
Microcornea with nystagmus	0 (0.0)	1 (0.09)	1 (0.09)
Total	56 (5.10)	65 (5.90)	121 (11.0)

Table 2 Severity of refractive error

	Myopia			Astigmatism		Hypermetropia		
	>−6D	−2 to −6D	<−2D	>1DC	<1DC	>1.5D	<1.5D	Total
No	0	17	30	5	23	9	5	89
%	0.00	19.10	33.70	5.62	25.84	10.11	5.62	100.00

amblyopia is made if the vision is 6/9 or worse after a careful eye examination including funduscopy through dilated pupil and cycloplegic refraction.

Strabismus is diagnosed by recording corneal light reflex combined with cover tests. Any children suspected of having strabismus are brought to BPKLCOS for further orthoptic evaluation. Vitamin A deficiency is determined by recording conjunctival dryness and Bitot's spot with or without a history of night blindness. The history of night blindness is obtained from the students themselves, which is later confirmed by their parents on a subsequent visit. Torch light examination and hand held slit lamps are used to confirm the diagnosis of vitamin A deficiency and anterior segment examination.

RESULTS

A total of 1100 children between 5 and 16 years of age were examined in the three schools visited; 505 were males and 595 were females. The mean age of the study population was 9.5 years. The prevalence of ocular morbidity found is given below in Table 1.

It is seen from Table 1 that 11% of children examined had some form of ocular morbidity, 5.10% were males and 5.90% were females. The commonest was refractive error (8.1%) followed by strabismus (1.6%), traumatic eye injury (0.54%), vitamin A deficiency (0.36%), and congenital abnormalities (0.36%). Myopia (4.3%) was a more common disability than hypermetropia (1.3%). Likewise, alternate divergent squint (1.4%) was more common than alternate convergent squint (0.09%). Right exotropia with amblyopia was found in 0.18% of children examined. Vitamin A deficiency (0.36%) presented with Bitot's spot, conjunctival xerosis, and night blindness. Traumatic eye injury (0.54%) was caused by injury with a stick (0.27%) or a fall on the ground (0.18%). One child had injury from a flame burn while cooking at home. Congenital ocular defects (0.36%) consisted of coloboma of the iris and disc (0.18%) and epiblepharon and bilateral microcornea with nystagmus in one student each. The ocular morbidity is almost equally distributed between sexes in all categories.

Severity of refractive error causing visual disability is shown in Table 2.

We did not find any student with myopia more than −6D. However, 19.10% of students with refractive error had myopia between −2D and −6D causing significant visual disability; 33.70% had myopia less than −2D. Similarly, 5.6% of students had significant visual morbidity with myopic astigmatism (>−1 DC); 25.8% had myopic astigmatism less than −1 DC. Likewise, 10.1% of students with refractive error had significant visual morbidity with hypermetropia more that +1.5D; 5.6% had hypermetropia less than +1.50D. Judging from the severity of refractive error, 31 children (34.8%) with refractive error had significant visual disability.

Vision in students with refractive error is shown in Table 3.

It is seen from Table 3 that 25.8% of children with refractive error had uncorrected visual acuity between 6/24 and 6/60 while 7.9% had uncorrected vision less than 6/60 causing severe visual impairment. Putting these two categories together 30 students (33.7%) had significant reduction in visual acuity. It is also seen from Table 3 that 12.4% of children with refractive error could not be corrected to vision 6/9 or better because of amblyopia.

Age distribution of students with refractive error is given in Table 4.

It is seen from Table 4 that myopia and myopic astigmatism were not found in children below 7 years of age. However, it started increasing steadily in older children. Among children with refractive error the prevalence of myopia was 4.5% in those 8–10 years of age, which increased almost fourfold in those aged 11–13 years (16.8%), and which almost doubled again at 14–16 years of age (31.5%). Myopic astigmatism

Table 3 Vision in students with refractive error

	Uncorrected			Corrected	
	6/9–6/18	6/24–6/60	<6/60	Better than 6/9	Less than 6/9
No	59	23	7	78	11
%	66.30%	25.84%	7.86%	87.64%	12.36%

Table 4 Age distribution of students with refractive error

	Simple myopia		Myopic astigmatism		Hypermetropia		Total	
Age (years)	No	%	No	%	No	%	No	%
5–7	0	0.00	0	0.00	1	1.12	1	1.12
8–10	4	4.49	5	5.62	5	5.62	14	15.73
11–13	15	16.85	6	6.74	4	4.49	25	28.09
14–16	28	31.46	17	19.10	4	4.49	49	55.05
Total	47	52.81	28	31.46	14	15.73	89	100.00

increased almost fourfold (5.6% to 19.1%) between those age groups. However, hypermetropia did not show such an increase.

DISCUSSION

The prevalence of ocular morbidity was 11% and that of refractive error was 8.1% in the study population. The Nepal Blindness Survey found refractive error, based on pinhole correction to be 1.3%.[2] However, refractive error was not measured here. Another study conducted in eastern Nepal found refractive error in schoolchildren to be less than 3%.[4] These large differences in refractive error may be because previous studies were conducted in communities whereas this study was conducted in schools. It may also be that the Nepal Blindness Survey was conducted more that 20 years ago and was a population based survey and the study in eastern Nepal involves a different geographical location and different ethnic groups even though its study population is of comparable age (5–15 years of age). However, our findings compare well with findings in China (12.8%), Chile (15.8%), and Delhi, India (7.4%)[5–7] all of which used populations of comparable age (5–15 years of age). On the other hand, a study in rural Tanzania using primary school children between 7 and 19 years of age did not find refractive error (1%) to be a significant problem.[8]

Myopia is the commonest refractive error (4.3%) followed by astigmatism (2.5%) and hypermetropia (1.3%). Myopia increased steadily after the age of 8 years. It increased sevenfold in older children (14–16 years of age). A similar pattern is shown in the Chinese study.[5] The most significant finding of the study is that 12.4% of children with refractive error could not be fully corrected and had no other ocular pathology and hence had already developed amblyopia. This compares well with studies from eastern Nepal (9%), Chile (6.5%), and China (5%).[4–6] Severity of refractive error (34.8%) compares well with severity of reduction in visual acuity (33.7%) in our study. This positive correlation between visual acuity and refractive error was not found in the Chinese study.[5]

Strabismus is the second commonest cause of ocular morbidity in our study. Alternate divergent squint is the commonest type of strabismus as opposed to alternate convergent squint. Exotropia was commoner than esotropia in studies in Chile, eastern Nepal, and Hong Kong.[4 6 9] However, findings from Western countries are contrary to our findings.[10–12] Amblyopia from exotropia seems to be rare as only two patients (0.18%) had right exotropia with amblyopia. The low prevalence of amblyopia in cases of strabismus in our study may be due to low prevalence of significant hypermetropia and esotropia.

Other preventable causes of ocular morbidity in our schools were ocular trauma and vitamin A deficiency. Most of the ocular trauma was caused by wooden sticks and falls on the ground, as is expected in schools. The prevalence of vitamin A deficiency was only 0.36% in this study compared with a prevalence of Bitot's spot of 1.65% in the earlier Nepal xerophthalmia survey,[3] 0.76 in Nepal Blindness Survey,[2] and 0.67 in the study from eastern Nepal.[4] Other studies were conducted in communities whereas this one was conducted in schools. The vulnerable preschool population is left out and poorer children, from the community may not attend schools. This may have underestimated the prevalence of vitamin A deficiency in our study.

CONCLUSION

It is seen that refractive error is the main cause of visual disability in schoolchildren in Kathmandu. One third of the children with refractive error had severe visual disability and 12.4% of them had already developed amblyopia. It is also seen that 97% (117 out of 121) of all visual disabilities in schoolchildren are preventable or treatable.

Although vision is very important to people of all ages, it is more so in children as it has a key role in their mental, physical, and psychological development. Most of adult blindness is easily treatable but visual morbidity in children, if not detected and prevented, in time leads to permanent disability. A child with visual impairment has to bear the scourge of visual disability for the years to come. Moreover, a developing country like Nepal cannot afford to bear the social and economic burden of caring for the visually impaired and blind children.

In view of the above facts, this kind of school screening cum prevention, promotion, and treatment programme with periodic evaluation seems to be appropriate to reduce ocular morbidity in schoolchildren in countries like Nepal.

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