

Original Article

# Refractive Error Among School Going Children in Solukhumbu, Nepal

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## ABSTRACT

**Introduction:** Reduced vision among school-going children is a global public health problem and uncorrected refractive error, the main causative factor is most prevalent in under-developed countries. Correction of refractive error can be easily done when diagnosed. Therefore regular eye health screening among school-going children and early correction is necessary to alleviate the problem and reduce its consequences.

**Materials and Methods:** It was a retrospective cross-sectional study and the data were retrieved from eye health screening camps conducted in different schools of Dudhkunda municipality in 2015 in collaboration with Solukhumbu Polytechnic Academy and District Community Eye Center Solukhumbu. Permission from respective authorities and ethical approval for the research was received from the institutional review committee of the Tilganga Institute of Ophthalmology. Out of 3097 records, 2517 records were analyzed to identify the prevalence of refractive error.

**Results:** Age of the children ranged from 6 to 18 years and most of the children were studying in grade 1 to 7, from government school and janajatis. Most common eye disorder noted was refractive error and prevalence was 3.5% (87). Refractive error was higher among older children compared to younger children. Higher proportion of students from private schools had refractive error compared to students from government schools. Both the findings were statistically significant.

**Conclusions:** Refractive error among school children in our study is lower than that of other studies conducted in Nepal and it may be due to the representation of younger age groups in our study.

**Keywords:** Refractive Error, School Children, Solukhumbu

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## INTRODUCTION

Uncorrected Refractive Error (URE) is a global challenge and a population-based study conducted in both developed and developing countries has shown that its prevalence varies from 0.7% to 22.3%.<sup>1</sup> Visual impairment from uncorrected refractive errors can cause a significant physical, psychological, social and economic impact in children and adults. Therefore identifying uncorrected refractive errors as early as possible and treating it on time is very crucial to prevent its negative impact.

Reduced vision is the major public health problem in school going children and also other population-based studies and is treatable. It is the main cause of childhood blindness in India.<sup>2,3</sup> Study on prevalence of refractive error in Nepal is lacking but few studies conducted in Nepal among school-age children showed that refractive error is the main cause of visual impairment.<sup>4-6</sup>

World Health Organization vision 2020 initiative, the right to sight

to eliminate avoidable blindness by 2020 has prioritized control of blindness in children. Nepal has also formulated a strategic plan of action 2002-2019 in 2001 with the main objective of eliminating avoidable blindness by 2020.<sup>7</sup>

Preventing childhood blindness is one of the prime agenda of IAPB (International Association for Blindness). Nepal has also aimed for it but our literature search shows that there are very few studies carried out in this regard. This is supported by the fact that national-level survey data from all districts of Nepal carried out to re-assess the situation of blindness in Nepal conducted by Nepal Netra Jyoti Sangh also lack to provide data on visual impairment among children in Nepal.<sup>8</sup>

District Community Eye Center (DCEC) has been in operation in Phaplu, Solukhumbu since 2003 in collaboration with Tilganga Institute of Ophthalmology, with support from Himalayan Cataract Project, USA. The DCEC Phaplu is run by a senior ophthalmic assistant, ophthalmic assistants, and ophthalmic health workers. Eye health screening, minor surgery, referral for needful cases, eye-health education, and eye-health promotion activities are conducted regularly by the center.

Eye health screening was conducted in all schools located at Dudhkunda municipality, Solukhumbu by the DCEC in collaboration with Solukhumbu Polytechnical Academy in 2015 and screened 3097 students from grade 1 to grade 12, the study was not published. Therefore, this study aimed to identify the burden of vision problem in school-going children and describe epidemiological distribution of the problem.

## MATERIALS AND METHODS

This is retrospective cross sectional study. The data were retrieved from School Eye Health screening program conducted in the year 2015 from all schools located at Dudhkunda municipality Solukhumbu. For the Utilization of the secondary data, approval was received from District Community Eye Center and Solukhumbu Polytechnic Academy. Ethical approval was received from the Institutional review committee of the Tilganga Institute of Ophthalmology.

Demographic information of school children and their parents and result of eye health screening were analyzed from records of children of ages from 6 to 18 years old. Incomplete and records, not illegible to read were excluded from the study and only 2517 records of school eye screening were analyzed out of total 3097 children screened. By taking the anticipated prevalence of 3% and the maximum allowable error of 5% at 95% confidence, the required sample size was 2485 and our sample size was higher than the required one.<sup>9</sup>

Eye examination and Visual Acuity testing of all students were done by eye health workers at school set up with the help of teachers by using the Snellen vision chart in a well-illuminated room. Students with poor vision (less than 6/12) were referred to DCEC Phaplu for refraction test. Referred students had subjective refraction tests by ophthalmic assistants and needful management was done and records were maintained. Further classification of refraction problems such as myopia, hyperopia, ametropia, etc. was not stated in the record, and the result was indicated as a normal eye, with refractive error and other eye problems.

Checklist consisting of age, sex, ethnicity, grade/class, a student with refractive error, students with normal vision and those with other eye problems, student residence address, and student's parents' occupation, and level of education was used to collect data. Data were collected by an ophthalmic assistant who was not involved in the research team to control bias. He was trained in advance to clarify the definition of study variables and understanding of records of school eye screening 2015.

Data entry was done in Microsoft Excel format. Though data entry was done by a single person double checking was done to minimize the data entry error. Missing data were checked immediately and the correction were done. Monitoring of the data entry was done regularly by one of the researchers who worked at DCEC, Phaplu. Data entered in Microsoft Excel 2010 was transferred to SPSS version 20 and analysis was done. The level of significance was set at 0.05 and descriptive statistics like frequency, mean are measured and correlations between different variables were determined by Chi-square test.

## RESULTS

Out of total 3097 students screened for eye health in 2015, we analyzed the records of 2517 students which fulfilled our inclusion criteria. Among 2517 records analyzed, the age of students ranged from 6 years old to 18 years old studying in grade one to twelve. Ratio of male (50.5%) and female (49.5%) were almost equal. Most of the students were, Janajati (75.2%), followed by Brahmin/Chhetri (14.7%) and Dalit (10%). Religion wise 50% of students were Buddhist, followed by 43.6% Hindus, 4.7% Christian and 1.7% Muslims Two thirds of students (66%) were from government schools and one third (33%) were from private schools.<sup>1</sup>

Regarding literacy rate of students' parents, 56.1% fathers and 40.2% mothers were literate. Among them, (34.3%) fathers and (25.10%) mothers were below Secondary Education Examination (SEE) level. Proportion of father and mother who had studied to SEE Level or above were 21.8% and 15.09% respectively. Regarding parents' occupation, main occupation of both parents were farming with 47.91% fathers and 42.6% mothers, followed by business 19.54% among fathers and homemaker 18.2% among mothers. Foreign employment was found as the third most common occupation with 10.72% of father and 10.29% mothers. Daily wages labors were found to be the least with 2.5% fathers and 1.6% mothers.

Cross-tabulation of parents' occupation and literacy status showed literacy rate as highest in office employed, followed by foreign employed and then business. Homemakers were the least literate. This trend was noted in both gender parents and both findings were statistically significant with a  $P < 0.01$  (0.000).

Refractive error was the most common problem (3.5%) noted in eye screening followed by conjunctival disorder (0.79%) Problems in lid and adnexa (0.56%) Corneal disorder (0.24%) and retinal and optic nerve problem (0.12%) were seen in children, respectively.

Cross tabulation of parent's occupation and levels of education and occurrence of refractive error among students is done at 0.01 level. The finding showed URE is seen highest among students whose parents are in foreign employment and least among students whose parents are home maker. Students whose mothers

are in foreign employment had 3.5 times more occurrence of URE (7.14%) compared to mothers who are home makers (1.95%). Similar trend, was also noted in fathers occupation and occurrence of URE among students. Students whose fathers are in

foreign employment had 2 times more occurrence of URE ( 5%) compared to home maker (2.7%). Cross tabulation of parent's levels of education and occurrence of URE among students did not differ significantly from each other.

**Table 1. Cross-tabulation of Students with refractive error and without refractive error with different socio-demographic variables.**

Socio-demographic Variables	With Refractive Error	Without Refractive Error	Chi-Square	p-value	Degree of Freedom
<b>School Type</b>			36.454a	00.000*	1
Government	32 (1.9%)	1648 (98.1%)			
Private	55 (6.6%)	782 (93.4%)			
<b>Ethnicity</b>			3.303	0.192	2
Dalit	13 (5.2%)	238 (94.8%)			
Brahmin/Chhetri	15 (4.1%)	355 (95.9%)			
Janajati	59 (3.1%)	1837 (96.9%)			
<b>Grade</b>			92.668a	0.000*	3
One to Three	24 (2.4%)	966(97.6%)			
Four to Seven	26 (3.1%)	802(96.9%)			
Eight to Ten	22 (3.4%)	620 (96.6%)			
Eleven to Twelve	15(26.3%)	42 (73.7%)			
<b>Students age</b>			34.380a	0.000*	2
Six to ten	11 (1.1%)	1001 (98.9%)			
Eleven to Fifteen	61(4.7%)	1250 (95.3%)			
Sixteen to Eighteen	15 (8.1%)	171 (91.9%)			

## DISCUSSION

A systematic review done by Naidoo et.al, analyzing worldwide data from 1990 to 2010 showed that URE is the leading cause of vision impairment and the second leading cause of blindness.<sup>10</sup> WHO stated that though vision impairment is a global problem, its burden is significantly higher in low and middle-income regions but not addressed.<sup>11</sup> Studies conducted in some parts of Nepal also showed that URE is the most common problem noted in school eye health screening,<sup>4,5,6,12</sup> but such study is found to be lacking in Solukhumbu district. Therefore this gap motivated us to conduct this study.

Our study found 3.5%(87) of students with a refractive error problem. The prevalence of refractive error in our study is much lower compared to study conducted in other parts of Nepal (Shrestha et al, conducted in Jhapa showed 8.5% and Niraula et al at Pokhara showed 5.74%).<sup>13,14</sup> Lower prevalence in our study compare to study at Jhapa and Pokhara may be attributed to the fact that the study sites (Jhapa and Pokhara) are more urbanized and developed than our Study site (Solukhumbu). On the contrary, a study done by R Dandona and L.Dandona in the rural part of India, which also has students' parents' main occupation as farming, similar to ours, has found a lower prevalence (2.7%),<sup>15</sup> compared to our study. This may be because our study site is rather semi urban setting than rural like the study site of R. Dandona and L Dandona in India. This finding which indicated that the urban population has a higher prevalence of refractive error than rural is also justified by other previous studies.<sup>16,17</sup> Solukhumbu is more of asemi urban area; and with more urbanization, there may be an increase in the occurrence of risk factors for refractive errors which will contribute to negative impact on eye health.

Compared to a study done by DR Niraula at Pokhara which included children between 10 years to 18 years and in grade 6 to grade 10, study participants in our study included younger children between 6 years to 18 years and in grade 1 to grade 12. This age difference in selection of study participants may have contributed high prevalence in of refractive error their study. This claim is supported by the fact that study conducted among children attending at Lumbini Eye Institute showed prevalence of refractive error higher among children between 11 years to 15 years compared to children between 6 years to 10 years.<sup>18</sup> This trend was also noted in our study and found proportion of refractive error to be highest (8.1%) in children of age group of 16 years to 19 years followed by (4.7%) children of age group of 11 years to 15 years and lowest (1.1%) in children of age group of 6 years to 10 years. This was statistically significant with p-value < 0.01.

Our study also showed that the proportion of children with refractive error is more in private schools (6.6%) compared to proportion of children in government school (1.9%). This was also statistically significant with p value less than 0.01. Similar finding was also shown in a study conducted at Pokhara by Niraula et al.<sup>14</sup>

Analysis of parent's occupation showed the that majority of the parents are in farming. However it was statistically not significant, it is interesting to note that children whose parents were foreign workers had the highest proportion of refractive error, whereas least refractive errors were seen among students whose parents were homemakers. The reason for the occurrence of refractive error difference due to parental occupation could not be elicited in this study as our research is a retrospective study and we have

limitations that we can analyze only available data. So further study is recommended as other factors, such as time spent on screen, indoor activities, outdoor activities, dietary habits, etc. may have a role on occurrence of refractive error in children.

## CONCLUSIONS

No previous studies had been conducted to identify the prevalence of refractive error in the children of Solukhumbu region and our study is the first of its kind. This will enable as baseline data for future researchers and policymakers. Through our research finding has shown that refractive error is more prevalent among higher age groups but the majority (70%) of the data we have

analyzed were younger age groups in the school of grades 1 to 7. Therefore, we would like to recommend further studies including school children with higher grades and this may elicit higher prevalence. We also recommend to identify the causes of refractive errors among school going children so that prevention can be done accordingly.

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