

## Prevalence of refractive errors among the school-going children in East Sikkim

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**Purpose:** Vision plays an important role in child's development for learning and communication. Uncorrected refractive error (URE) has become a major challenge to health care policy makers especially in school going children. We aim to report the prevalence of refractive error among the school students of the east district of Sikkim, India. **Methods:** A cross-sectional study was carried out among 15,954 school children under school health program of national program for control of blindness. The screening was conducted in 40 schools of east district which included primary, higher secondary, monastic and private schools. **Results:** The prevalence of refractive error was 6.7% among which myopia was the most common error present in 335 (31.1%) children, followed by astigmatism in 317 (29.4%) and the remaining 29 (2.6%) with hyperopia. The age group between 14-17 years had high prevalence of refractive error (9.2%). Females had slightly higher refractive error (6.93%) than males (5.9 %). Most backward classes were found to be highest suffering from refractive error (26.65%) and the least seen was found in schedule tribe (11.6%). **Conclusion:** The study provides a useful and baseline data about the refractive error amongst the school children of east Sikkim. A larger study needs to be conducted in all the schools of the state to get a clearer picture of RE and other eye related diseases to detect vision problem as early as possible.

**Key words:** Hyperopia, myopia, prevalence, refractive error, Sikkim India

Vision plays an important role in a child's development for learning and communication.<sup>[1]</sup> Uncorrected refractive error has become a major challenge to the health care policymakers.<sup>[2]</sup> An estimated 19 million children are visually impaired worldwide of which 12 million are due to refractive errors which could be easily corrected.<sup>[3]</sup> While many screening programs in schools are being carried out, there is a lack of accurate data in the prevalence of visual impairment.<sup>[4]</sup>

Active screening and timely intervention at the right time will not only help in vision restoration but will also influence a child's growth and development.<sup>[5,6]</sup> In 1960, the Government of India constituted a school health committee which recommended medical examination of the children at the time of entry into school but this has hardly been in practice in India.<sup>[7]</sup> Our study will be the first to report the prevalence of refractive errors among school-going children in Sikkim.

## Methods

### Study design

A cross-sectional study was conducted among the school children of East Sikkim from March 2016 to March 2018. The study was done under the School Health Program of the National Program for Control of Blindness (NPCB) for

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identification and treatment of refractive errors. The screening was carried out in 40 schools which included primary, higher secondary, monastic, and private schools.

### Study population

A total of 15,954 children were screened for refractive errors. Permission was taken from the principals of the selected schools. Informed and written consent was obtained from the teachers prior to enrolling the students for the study. Ethical clearance was obtained from the institutional ethics committee (IEC no. 06/IEC/STNMH/20).

### Eye examination

An eye team consisting of a senior optometrist visited the selected schools. The teachers were selected depending upon the total number of students in the school for the training program organized by the optometrists under the guidance of ophthalmologists. The teachers were sensitized about the magnitude of childhood blindness, their role in the early detection of vision problems, and other eye diseases. They were trained to screen the vision in each eye separately using the Snellen chart in their respective schools and to record questionnaires. An eye health education program was conducted for the students and teachers to make them aware of eye health. The children detected to have any ocular anomaly by the trained teachers were referred first to an optometrist, who did subjective

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correction by placing the appropriate lenses in the trial frame. The visual acuity tested with the Snellen chart placed at 6 m for any children with refractive errors and for children below 10 years cycloplegic refraction was done using Homatropine 2% eyedrops after 2 h of instilling the drops. Lastly, those who still did not improve were referred to the base hospital for further complete ophthalmic examination by the ophthalmologist.

Refractive errors were diagnosed when the presenting visual acuity was less than 20/40 and improved to >20/40 with correction. Myopia was defined as measured objective refraction of  $>_{-}0.5D$  spherical equivalent in one or both eyes. Hyperopia was considered when the measured objective refraction of  $>_{+}2.0D$  spherical equivalent in one or both eyes was present. Astigmatism was considered when the measured objective refraction of  $>_{-}0.75D$  cylinder was there in one or both eyes. These refractive errors were categorized according to the Refractive Error Study in Children (RESC) Survey group.<sup>[8]</sup>

The data were entered into the Excel sheet and analyzed using the Statistical Package for the Social Sciences version 16.0 (SPSS Inc, Chicago, IL, USA). The data were expressed as proportions ( $n$ , %).

## Results

A total of 15,954 school children were screened from 40 different schools of East Sikkim. Refractive error was highly prevalent in the age group of 14–17 years with 9.2% ( $n = 419$ ) among 4,582 students followed by 8.2% ( $n = 430$ ) in the age group 10–13 years in a total of 5,741 children. However, the age group between 6 and 9 years had comparatively less prevalent refractive errors with 3.7% ( $n = 228$ ) among 6,131 students [Table 1]. We also observed that increasing age was associated with an increased risk. From a total of 15,954 students studying in different schools of East Sikkim, the prevalence of refractive errors was 6.7% ( $n = 1077$ ) among which myopia was the most common with 31.1% ( $n = 335$ ), followed by 29.4% of astigmatism ( $n = 713$ ), and the remaining 2.6% ( $n = 29$ ) with hyperopia [Table 2]. Regarding gender, out of 7,450 males, 6.5% (487) had refractive errors whereas 6.93% (590) females had refractive errors from a total of 8,594 [Table 3]. Some other ocular cases like squint, vitamin A deficiency, and cataract were also diagnosed by the ophthalmologist but could not be recorded for analysis due to the unavailability of data. We also observed that the children in monastic school had refractive errors.

Sikkim is home for a majority of ethnic communities distributed as schedule caste (Damai, Kami, Lohar, Majhi, and Sarki), most backward classes (Bujel, Gurung, Manger, Rai, Sunar, Jogi), and schedule tribe (Tamang, Limboo, Bhutia, Lepcha).<sup>[9]</sup> We recorded 4,265 students belonging to schedule caste with 287 (26.65%) suffering from refractive errors followed by 3,400 most backward classes (MBC) with refractive errors of 1,876 (55.2%); 125 (11.6%) students were found to be suffering from refractive errors belonging to scheduled tribe (ST) communities among 1,851 students and the remaining 6,438 belonged to others with refractive errors of 2,547 (39.5%) [Table 4].

## Discussion

Screening programs in schools are primarily aimed at detecting refractive errors but the health services provided are

**Table 1: Age distribution of refractive error in primary school children of East Sikkim**

Age group (years)	Total no. of students	Refractive error	%
6-9	6,131	228	3.7
10-13	5,241	430	8.2
14-17	4,582	419	9.1
Total	15,954	1,077	6.7

**Table 2: Refractive error based on myopia, hyperopia, and astigmatism among the school children**

No. of students	Myopia (%)	Astigmatism (%)	Hyperopia (%)
1,077	335 (31.1%)	317 (29.4%)	29 (2.6%)

**Table 3: Gender distribution of refractive errors in the primary school of East Sikkim**

Gender	No. of students examined	Refractive error	Refractive error (%)
Male	7,450	443	5.9
Female	8,554	590	6.93
Total	15,954	1,077	13.43

**Table 4: Caste distribution of refractive error in primary school children of east Sikkim**

Caste	Total no. of students examined	Refractive error (%)
Scheduled caste (SC)	4,265	26.65
Most backward classes (MBC)	3,400	55.2
Scheduled tribe (ST)	1,851	11.6
Others	6,438	39.5
Total	15,954	100

inadequate due to the shortage of resources and insufficient infrastructure.<sup>[10]</sup> Geographically, the East district of Sikkim has three subdivisions, Gangtok (capital), Pakyong, and Rongli, constituting a population of 283,583 (2011 census).<sup>[11]</sup> This is the first prevalence study on refractive errors being conducted in the state.

We observed that the school children within the age group of 14–17 years were found to be the highest (9.2%) with refractive error and are comparable with many studies indicating that with increasing age, the disease increases.<sup>[12-14]</sup>

Girls were mostly affected with (6.9%) refractive errors as compared to boys (5.9%) and many have reported similar studies.<sup>[15,16]</sup> According to Gouda SM *et al.*, school dropouts in males (11.1%) were more than the females (8.8%)<sup>[17]</sup> in Sikkim.

The overall prevalence of refractive errors in the study was 6.7% which is in consort with the study reported by Warad C *et al.*<sup>[18]</sup> in Karnataka (6.4%). However, a few studies have reported a higher prevalence and this could be due to multiple factors like population size, geographical locations, and race

leading to various disparities.<sup>[19]</sup> We also observed that the children studying in monastic schools also had refractive errors who are often ignored.

Myopia was the most common refractive error (31.1%) followed by astigmatism (29.4%), and hyperopia (2.6%) being the least and many studies have reported similar results.<sup>[8,13,20-23]</sup>

Among the ethnic communities, refractive error was most prevalent among the students belonging to most backward classes with refractive error (55.2%) and the least in schedule tribe (11.6%). According to Saw *et al.*<sup>[23]</sup> in 2006 and Rai SK *et al.*<sup>[20]</sup> in 2015, refractive error varies with ethnicity. Various components like nutrition, lifestyle, and hereditary might be involved in contributing to the rise of refractive errors.

## Conclusion

The study provides useful and baseline data about the refractive errors among the school children of East Sikkim. Refractive error was highly prevalent in students belonging to most backward classes, among girls, and in between the age group 14–17 years. Our study also focused on students attending monastic schools which generally remains ignored. A larger study needs to be conducted in all the schools of the state to get a clearer picture of refractive errors and other eye-related diseases to detect vision problems as early as possible.

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### Conflicts of interest

There are no conflicts of interest.

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